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REPORTS OF THE

DEPARTMENT OF THE INTERIOR

FOR THE FISCAL YEAR ENDED JUNE 30

1915

ADMINISTRATIVE REPORTS

IN 2 VOLUMES

VOLUME I

SECRETARY OF THE INTERIOR
BUREAUS, EXCEPT OFFICE OF INDIAN AFFAIRS
ELEEMOSYNARY INSTITUTIONS
NATIONAL PARKS AND RESERVATIONS

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1916

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National parks and reservations.

Vol. II. Indian Affairs.
Territories.

Report of the Commissioner of Education, in 2 volumes.

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DEPARTMENT OF THE INTERIOR.

Secretary of the Interior.....Franklin K. Lane.
First Assistant Secretary.....Andrieus A. Jones.
Assistant Secretary.....Bo Sweeney.
Assistant to the Secretary.....Stephen T. Mather.

Commissioner of the General Land Office.....Clay Tallman.
Assistant Commissioner.....Charles M. Bruce.

Commissioner of Indian Affairs.....Cato Sells.
Assistant Commissioner.....Edgar B. Meritt.

Commissioner of Pensions.....Gaylord M. Saltzgaber.
Deputy Commissioner.....Edward C. Tieman.

Commissioner of Patents.....Thomas Ewing.
First Assistant Commissioner.....James T. Newman.
Assistant Commissioner.....Robert F. Whitehead.

Commissioner of Education.....Philander P. Claxton.

Director of the Geological Survey.....George Otis Smith.

Director and Chief Engineer of the Reclamation Service.....Arthur P. Davis.
Chief of Construction, Reclamation Service.....Sydney B. Williamson.
Chief Law Officer, Reclamation Service.....Will R. King.
Comptroller, Reclamation Service.....William A. Ryan.

Director of the Bureau of Mines.....Van. H. Manning.

Chairman Alaskan Engineering Commission.....William C. Edes.
Member Alaskan Engineering Commission.....Lieut. Frederick Mears, U. S. A.
Member Alaskan Engineering Commission.....Thomas Riggs, jr.

Governor of Alaska.....J. F. A. Strong.

Governor of Hawaii.....Lucius E. Pinkham.

Superintendent of Capitol Building and Grounds.....Elliott Woods.

Superintendent of Government Hospital for the Insane.....Dr. William A. White.

President Columbia Institution for the Deaf.....Dr. Percival Hall.

President Howard University.....Dr. Stephen M. Newman.

Surgeon in Chief Freedmen's Hospital.....Dr. William A. Warfield.

REPORT OF THE SECRETARY OF THE INTERIOR.

8161°—INT 1915—VOL 1——1

BUREAUS OF THE INTERIOR DEPARTMENT.

The Department of the Interior was established by the act of March 3, 1849 (9 Stat. L., 395).

GENERAL LAND OFFICE.

Organized as a bureau of the Treasury Department under act of April 25, 1812 (2 Stat. L., 716).

First commissioner, Edward Tiffin, of Ohio; appointed May 7, 1812.

Became a bureau of the Interior Department when that department was organized under the act of March 3, 1849 (9 Stat. L., 395).

INDIAN OFFICE.

Organized as a bureau of the War Department under act of July 9, 1832 (4 Stat. L., 564).

First commissioner, Elbert Herring, of New York; appointed July 10, 1832.

Became a bureau of the Interior Department when that department was organized.

BUREAU OF PENSIONS.

Organized as a bureau of the War Department under act of March 2, 1833 (4 Stat. L., 622).

First commissioner, James L. Edwards, of Virginia; appointed March 3, 1833.

Became a bureau of the Interior Department when that department was organized.

PATENT OFFICE.

Organized as a bureau of the State Department under act of March 4, 1836 (5 Stat. L., 117).

First commissioner, Henry S. Ellsworth, of Connecticut; appointed July 4, 1836.

Became a bureau of the Interior Department when that department was organized.

BUREAU OF EDUCATION.

Organized under act of March 2, 1867 (14 Stat. L., 434).

Became a bureau of the Interior Department July 1, 1869, under act of July 20, 1868 (15 Stat. L., 106).

First Commissioner, Henry Barnard, of Connecticut; appointed March 14, 1867.

GEOLOGICAL SURVEY.

Organized as a bureau of the Interior Department under act of March 3, 1879 (20 Stat. L., 394).

First Director, Clarence King, of New York; appointed April 14, 1879.

RECLAMATION SERVICE.

Organized under act of June 17, 1902 (32 Stat. L., 388), under the Director of Geological Survey, Charles D. Walcott.

First Director, F. H. Newell, of Pennsylvania; appointed March 9, 1907.

BUREAU OF MINES.

Organized as a bureau of the Interior Department under the act of May 16, 1910 (36 Stat. L., 369).

First Director, Joseph A. Holmes, of North Carolina; appointed September 3, 1910.

REPORT OF THE SECRETARY OF THE INTERIOR.

WASHINGTON, *November 20, 1915.*

SIR: In presenting an outline of the year's work I make bold to express the hope that no other policies of this Government may be allowed to stay the internal development of this country. There is a fear, how general I do not know, that this Government will halt in carrying out its full and needed program of legislation affecting home affairs because of the immediate need for strengthening our national defenses. This apprehension arises, I am confident, out of no lack of sympathy with the plan to increase the Army and the Navy, but out of a feeling that the Government in both executive and legislative branches will be so immersed in matters military and naval as to overlook these matters of less dramatic and perhaps less immediate concern.

NATIONAL PRIDE IN DEVELOPMENT.

Any such course would, I am sure, offend the most deep-seated instinct of our people, for in the development of this continent, the discovery of its resources and their highest utilization, there is a fascination to the American which is superlative. It is indeed our life, and has called out the most sterling qualities in our character. Those foreigners who write of our country often engage in facetious if not scornful comment upon our bombastic manner of telling the story of our growth and of the things achieved or possessed. They fail unfortunately to see far enough into the secret of our pride. To have taken the prize for the largest pumpkin at the county fair, or to have milled more ore in a day than any other mine, or to have

built the highest dam in the world[1]—such things are to us adventures, which make the game of opening a new country worth while.

No one would smile when told that a foreign army had made an unprecedented number of miles in a day's march, or had brought into action a gun of unrivaled caliber, or built a ship of unequaled displacement or power. These are the very things on which nations pride themselves as revealing their capacity, ingenuity, and resourcefulness. They make for national self-respect and self-confidence. And so it is with the American. His place in the scheme of things is to reveal to the world what can be done in the development of a new country, and every crop raised, every schoolhouse built, every rail laid, every nail driven is evidence that the work he is sent to do is being done. Instead of being the petty boasting of a parochial-minded provincial, this spirit is of the very essence of the highest creative quality.

It is not a figure of speech to say that every American has it in his heart that he is in a small sense a discoverer; that he is joining in the revelation to the world of something that it was not before aware of and of which it may some day make use. Men work for what they think worth while, and if they find their joy in proving that land has coal, or will raise wheat, or that a refractory ore may be reduced at a practicable cost, and tell about it proudly, they may be serving themselves, but they are also serving the world. The clerk in the store or the mechanic in a mill may not consciously engage in any enterprise which makes this appeal, but when he learns that the Government of which he is a part has within the year opened a town on the shores of the North Pacific which now has nearly

[1] The Arrowrock Dam was completed two years ahead of time and for more than a million dollars less than the estimated cost. This dam was constructed to supply the lands around Boise, Idaho, with water for irrigation. The dam will bear the following plate: "Arrowrock Dam. Maximum height 348.5 ft. Height above river bed 260 ft. Thickness at base 240 ft. Thickness at top 15.5 ft. Length along crest 1,100 ft. Length of spillway 400 ft. Concrete in dam 585,200 cu. yds., in spillway 25,400 cu. yds. Capacity of reservoir 244,300 acre feet, 79,642,000,000 gallons. Construction authorized in January, 1911, by R. A. Ballinger, Secretary of the Interior, upon recommendation of F. H. Newell, Director, and A. P. Davis, Chief Engineer of the United States Reclamation Service. Designed and built under general direction of F. E. Weymouth, supervising engineer, Idaho district, with Charles H. Paul, construction engineer, in direct charge, and James Munn, superintendent of construction. Completed November, 1915, under the administration of Franklin K. Lane, Secretary of the Interior."

3,000 inhabitants, and has driven a railroad nearly 40 miles inland toward the Arctic Circle on its way to the coal fields of the Matanuska and the gold fields of the Tanana, he has a feeling that he, too, is participating in the making of this new world. One might say that this was nothing more than sentimental pride. There is a truer and a more dignified word for this quality; it is the expression of the American instinct for improvement. We have a passion for going into the unknown, for answering the puzzles that are put to us. Our imagination is challenged by difficulty. And the result has been a century of growth, which in its magic and in its largeness casts a spell upon the mind.

THE FOUNDATIONS OF POWER.

Some months since I sought to learn what I could of the assets of this country as they might be revealed by this department; where we were in point of development, and what we had with which to meet the world which was teaching us that war was no longer a set contest between more or less mobile armed forces but an enduring contest between all the life forces of the contesting parties, their financial strength, their industrial organization and adaptability, their crop yields, and their mineral resources, and that it ultimately comes to a test of the very genius of the peoples involved. For to mobilize an army, even a great army, is now no more than an idle evidence of a single form of strength if behind this army the nation is not organized. An army is no longer merely so many rifles and men, cartridges and horses; but chemists and inventors, mines and farms, automobiles and roads, airships and gasoline, barbed wire and turning lathes, railroads and weather prophets—indeed, the complete machinery of an industrial nation's life. And out of the reports then made these facts stand out:

Minerals.

With the exception of one or two minor minerals, the United States produces every mineral that is needed in industry, and this can be said of no other country. We produce 66 per cent of the world's output of petroleum, 60 per cent of its copper, 40 per cent of its coal and iron, and 32 per cent of its

lead and zinc. Tin in small quantities is produced in Alaska and platinum in Oregon, Nevada, and California, manganese in Virginia, Georgia, Arkansas, and California; but of these latter minerals, as of nickel and some others of less importance, our supply is altogether inadequate for our consumption.[1] We can build a battleship, or an automobile (excepting the tires), a railroad or a factory,

Fertilizers. entirely from the products of American mines and forests. To replenish the soil we have phosphorus in abundance, potash is known to exist in the deposits of Searles Lake, California, which, however, is not yet commercially available, and in alunite where it is combined with aluminum and deposits of which are found in several States; and nitrogen can be extracted from the air by cheap hydro-electric power as is now done in Germany, Norway, and elsewhere. So that we can feed the earth and keep

Climate. it sustained. Our soil and climate are so varied that we can produce all the grains, fruits, vegetables, and fibers known to the Temperate Zone, and some found in the semitropics. And to crown all these we have water

Water power. power that can be made to generate perhaps as much as 60,000,000 horsepower.

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[1] For a full presentation of the mineral resources of the country see pp. 153 to 211.

The adaptability and resourcefulness of American chemists and engineers has been proved during this war as never before. A few illustrations will point this fact: Barium salts, needed for a variety of purposes, were formerly imported in large quantities, although the raw material, barytes, occurs in extensive deposits in this country. We now manufacture these salts in California, Colorado, Illinois, Pennsylvania, New York, Tennessee, and West Virginia, the new industry not only meeting the domestic demand but also furnishing large quantities of barium compounds for export, and we are substituting domestic barytes for the foreign material for all purposes. The substitution of sodium cyanide for potassium cyanide in the treatment of gold ores to the extent of more than half a million pounds in Colorado alone illustrates how the potash shortage is being met throughout the mining States. Tungsten, an absolutely essential constituent in high-speed tool steel, is being mined at more points than ever before to meet the special demand in the steel-working industry; a tin smelter has been erected to reduce Bolivian ores; cobalt, which is a recent and valuable acquisition to the family of steel-alloying metals, is now being produced in quantity sufficient to lower the market price; American antimony is quoted in the metal market for the first time, and from Alaska alone more antimony ore has been shipped this year than was ever before produced from American mines in any one year; cadmium, formerly imported, is now an article of export; and in other minor metals full independence of foreign supplies is being worked out. Practically all the crude platinum from Colombia and part of the New Zealand output is coming to the United States for refining. The position of American zinc in the world market is most striking; in the first half of 1914 the exports from the United States were $109,000, in the second half, $8,650,000, and in the first half of 1915, $11,963,000, or more than a 100-fold increase over the same period in 1914, and the increase continues.

Public lands.

The public domain is rapidly growing less, which means that it is being occupied and used. Of the two hundred and odd million acres left, 12,000,000 acres have already been classified as coal bearing, over 4,000,000 as probably carrying oil, and 2,600,000 as phosphate lands. The most valuable discovery made in recent years as affecting the public domain is that the semiarid regions may become abundantly productive under dry-farming methods. The Territory of Alaska, containing perhaps 400,000,000 acres, is now the great body of public domain. It is heavily mineralized and is a land of unknown possibilities. One gold mine there has recently erected a mill of 6,000 tons daily capacity, with ore in sight to run this mill for 50 years.

Alaska.

The desert.

The waters that flow idly to the sea could be made to support not less than 50,000,000 people if turned upon the land that otherwise will remain pasture land or altogether worthless. The demonstration has been given that the lands of little rain can be made more fruitful than those where the rainfall is abundant. Land and water we have; the problem of bringing them together is one only of money.

Scientists.

When the war in Europe shut off certain chemical supplies, one of our chemists, Mr. Rittman, found a new process which has been given to the public by which benzol and toluol, the foundation of aniline dyes and explosives, and gasoline may be made from crude petroleum. Mr. Parsons and Mr. Moore have devised and proved a process for the reduction of radium from carnotite ores. An oil expert, Mr. Pollard, was put to the task of saving the billions of feet of gas wasting daily into the air from the oil wells of Oklahoma, and was successful. Mr. Cottrell has devised a method of taking solids and liquids out of smelter smoke, such as sulphuric acid, arsenic, zinc, and lead.

Inventors.

During the past 50 years the people of the United States have uttered two-thirds of all the revolutionary epoch-making inventions of the world, ranging from the telephone and the incandescent lamp to Wright's

aeroplane and high speed steel.[1] Each day we issue an average of 200 letters patent to American inventors, and the number of inventions is increasing with the years.

Children. There are over 20,000,000 boys and girls in the public schools of the United States.

These, then, are the assets of the United States as revealed in but this one department—lands and waters and mines, inventors and chemists and engineers, and a new generation coming on which

[1] The list furnished is as follows:

Invention.	Inventor.	Date.
Telephone	Bell	1876
Typewriter	Sholes	1878
Cash register	Patterson	1885
Incandescent lamp	Edison	1880
Talking machine	....do	1878
Electric furnace reduction	Cowles	1885
Electrolytic alkali production	Castner	1890
Transparent photograph film	Eastman	1888
Motion-picture machine	Edison	1893
Buttonhole sewing machine	Reece	1881
Carborundum	Acheson	1891
Calcium carbide	Willson	1888
Artificial graphite	Acheson	1896
Split-phase induction motor	Tesla	1887
Air brake	Westinghouse	1869
Electric welding	Thomson	1880
Type-bar casting	Mergenthaler	1885
Chain-stitch shoesewing machine	French & Myers	1881
Single-type composing machine	Lanston	1887
Continuous-process match machine	Beecher	1888
Chrome tanning	Schuls	1884
Disk plows (modern type)	Hardy	1896
Welt machine	Goodyear	1871
Electric lamp	Brush	1879
Recording adding machine	Burroughs	1888
Celluloid	Hyatt	1870
Automatic knot-tying harvester machine	Appleby	1880
Water gas	Lowe	1875
Machine for making barbed wire	Glidden	1875
Rotary converter	Bradley	1887
Automatic car coupler	Janney	1873
High-speed steel	Taylor & White	1901
Dry-air process for blast furnace	Gayley	1894
Block signals for railways	Robinson	1872
Trolley car	Van Depoele & Sprague.	1884–1887
Harveyized armor plate	Harvey	1891

As compared with this list, note the following list of important inventions that have been made during the same period by foreigners, which has been compiled from information furnished by the 43 examining divisions of the Patent Office:

Invention.	Date.	Inventor.	Nationality.
Electric steel	1900	Heroult	French.
Dynamite	1867	Nobel	Swedish.
Artificial alizarene (dye)	1869	Graebe & Lieberman	German.
Siphon recorder	1874	Thompson	English.
Gas engine, Otto cycle	1877	Otto	German.
Wireless telegraphy	1900	Marconi	Italian.
Smokeless powder	1886	Vielle	French.
Diesel oil motor	1900	Diesel	German.
Centrifugal creamer	1880	De Laval	Swedish.
Manganese steel	1884	Hadfield	English.
Electric transformer	1883	Gaulard & Gibbs	Do.
Cyanide process for extracting metal	1888	Arthur & De Forrest	Do.
Mantle burner	1890	Welsbach	Austrian.
By-product coke oven	1893	Hoffman	Do.

will add still further to the adventurous annals of peace. What has been our policy with respect to these? How may they be the more highly put to use? These questions are seen to be more vital than ever before. And at the outset let me say that I find no need for a change of policy, but only for its expansion.

THE ERA OF SPLENDID GIVING.

We have given of our resources as no people ever did before or ever can again. Within 50 years we gave in subsidies to our railroads public lands that exceeded in size a territory seven times as large as the State of Pennsylvania. We have given to the States, for the sustaining of their schools and other public institutions, an amount that our records do not accurately state, but this we know, that 13 western States were given over 67,000,000 acres.[1] In addition, the Federal Government gave to the States all the swamp and overflowed public lands within their borders, amounting to 64,000,000 acres by roughest approximation, upon condition that they used the proceeds to reclaim the lands, a condition which it may be idle to state has been only in part complied with.

Every country has found itself in embarrassment at the close of a great war. From Rome under Cæsar to France under Napoleon the problem arose as to what could be done with the men who were to be mustered out of service. No such embarrassment, however, came to the United States at the end of the Civil War, for out of our wealth in lands we had farms to offer the million veterans—and better use was never made of any land. Even to-day this "soldiers' scrip" is recognized and is filed to secure choice bits of forest lands or power sites.

Indeed, the peoples of the world were called in and tendered homes, until now, out of an acreage within the United States of a

[1] The land grants to States were as follows:

	Acres.		Acres.
Arizona	10,489,236	North Dakota	3,163,476
Colorado	4,431,778	Oregon	4,087,920
Idaho	3,631,778	South Dakota	3,432,604
Montana	5,867,618	Utah	7,414,276
Nebraska	3,457,911	Washington	3,044,471
Nevada	2,723,647	Wyoming	4,188,569
New Mexico	12,406,026		

In addition, 5 per cent of the net revenues from the sale of public lands goes to these States, and this amounted to $4,254,670.20 up to July 1, 1914. The Federal Government also appropriates $50,000 to each of these States in aid of an agricultural college.

full billion and a half of acres of public domain, we have left as public lands subject to disposal as homesteads and otherwise, less than 280,000,000 acres,[1] not one-half of which, it may safely be said, will ever prove to be cultivable. There passed out of this office last year 61,979 patents to land, some for 160 acres and some for 320 acres—donations from the Nation to the courageous pioneer.

The man who finds gold or silver or iron or lead or copper, or any other of the so-called metalliferous minerals, has it for the asking, *sans* money and *sans* price, a prize for discovery. We expend $1,500,000 a year now in the making of geological and other studies of the country that we may know what we have.[2]

And all the revenue from the sale of public lands (less 5 per cent, which goes to the States) goes into a fund for the building of irrigation works to reclaim the desert. A hundred million has been so spent, which is, however, no more than a loan to the farmers. However, before attempting the governmental construction of such works the Federal Government said to the States through the Carey Act: "If you will irrigate the lands of your State, or if there are private individuals who will do this work, we will give you whatever land you desire up to 1,000,000 acres each and set it apart for 10 years while you try the experiment." Yet but a small portion of these lands were ever called for by the States, and a still smaller portion have been irrigated, although a number of these projects have been extremely successful. In some parts of the West, however, the desert is dotted with the deserted homes of those who were lured onto these lands by promising financiers, some promising in good faith and some in the spirit of Mr. J. Rufus Wallingford.

Was there ever a more generous method taken of populating and developing a new land? Surely there has been no niggardliness on the part of the Government, which has not asked from those who took its lands even so much as the cost of their administration.

In doing all this with so lavish a hand the Government has been expressing the generous instinct of the people and their absorbing determination to "go forth and find." For a hundred years and a

[1] When the grants to the States are satisfied this amount will be diminished by over 15,000,000 acres.

[2] As a utilization in most practical form of these studies there have been published during the past year four books of an original character—geological guidebooks along the western railroad lines, one along the Northern Pacific, another along the Union and Central Pacific, a third along the Santa Fe route, and a fourth along the Southern Pacific coast line. These tell by map and picture in simple and untechnical language the story of the formation and character of the land through which the tourist is passing.

little more this quest has been the drama of our life. It has given color to our civilization and buoyancy to the hearts of the people. It has been a century of revelation, and as yet we have only the most superficial knowledge of what this land is, of what it will yield to research, and how it may best be used. Its development has only begun.

TO USE, NOT TO HOLD OR WASTE.

But in all our giving we have been guided by a purpose—the land that we gave was to be converted from wilderness into homes, or from rock into metal. We gave to the States and to the railroads, with a reservation of minerals. We gave to the homesteader, with a condition—the land was to be used. We gave our swamp lands, but to be reclaimed. We found our coal lands going as farms and we put a price upon them. We saw our forests being swept clean or monopolized and we held them out from the mass. Use! Use by as many as possible! The superior use! These were the things we wished and these gave form to our legislation. No homesteader receives all the lands he wishes, or even all he might use. One hundred and sixty acres was the limit, not a full section. But now he may have 320 acres if it is dry farming or grazing land—and for the latter the size might still be increased. And he can not have it as a speculation. It must be made a home and brought into the body of the world's producing area by cultivation. The Government was generous, but it had no intention of being a spendthrift. When it found itself being imposed upon it stayed its hand and drew back. So it came about that lands were withdrawn from entry—the Alaskan coal lands, the oil and the phosphate lands, dam and reservoir sites for power plants, and a few water holes which commanded the adjoining miles of desert. The Nation stayed its hand and drew back, so as to make sure of the right course. It wished use—use by as many as possible and the best use.

And now we have come to a point where it can be said that if Congress will pass two bills now before it there will be no resource in reserve, of all its vast treasure in lands, save national forests and national parks.[1]

[1] The map on page 13 shows the amount of lands already given to the States and to private individuals, the amount reserved as forests, and the permanent reservations, such as national parks and Indian reservations.

State.	Classification of lands.				Total area.
	Private and State lands.	National forests.	Other reservations.	Lands subject to entry.	
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Arizona	6,597,242	12,499,485	16,931,346	36,810,327	72,838,400
California	57,769,932	19,805,796	1,405,629	20,635,923	99,617,280
Colorado	35,145,483	13,198,580	760,943	17,236,114	66,341,120
Idaho	18,721,791	17,706,597	705,899	16,212,273	53,346,560
Montana	51,376,357	16,272,075	6,855,087	19,065,121	93,568,640
Nevada	8,868,178	5,299,319	700,197	55,417,746	70,285,440
New Mexico	37,455,602	8,592,660	4,564,801	27,788,857	78,401,920
Oregon	30,648,734	13,221,532	1,876,036	15,442,178	61,188,480
Utah	10,123,902	7,472,374	1,637,647	33,363,837	52,597,760
Washington	28,398,243	9,828,826	3,403,366	1,144,605	42,775,040
Wyoming	20,292,423	8,413,846	2,823,922	30,929,969	62,460,160
Total	305,397,887	132,311,090	41,664,873	274,046,950	753,420,800

NOTE.—Of the 274,000,000 acres of vacant public land in these 11 States, about 14,800,000 acres will be required to satisfy the remaining land grants to these States.

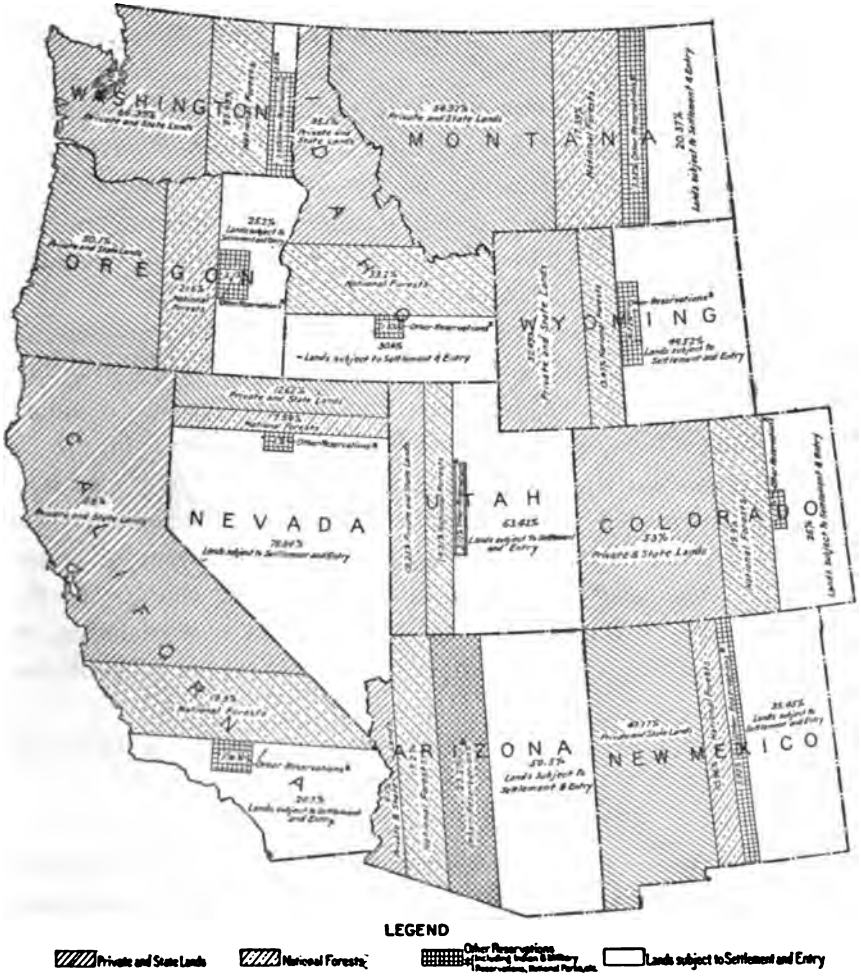

FIG. 1.—Status of the public domain, June 30, 1915, in eleven Western States.

Two years ago I presented in my report what might be termed a program of internal development with respect to land; a railroad into the interior of Alaska; a coal-leasing law for Alaska; a new reclamation act extending the time within which payments were to be made by water users and under which land would be forced into use; a water-power bill governing the use of public lands for hydro-electric development; a general development bill providing for a practicable method of disposing of our oil, gas, coal, phosphate, and potash without danger of monopoly or nonuse. Of this program the larger portion has been adopted, but the last two failed of passage in the Senate after having been successful in the House. The plan is to make the West help in its own development. The royalties from oil, gas, coal, and phosphate lands and from water power developed on public lands should be used for the reclaiming of the arid country and then divided with the States.

The Alaskan railroad is being built. The Alaskan coal-leasing bill has already been put into effect in a small way by the granting of permits for the operation of small and isolated tracts for industrial and local use. The lease under which the larger fields which have been reserved may be taken up has been drafted in cooperation with some of the most eminent mine operators of the country. Its utilization must, of course, await the opening of means of transportation. The new reclamation act has brought courage to the water users, who found their difficulties almost overwhelming, so new and strange to the people of our northern blood are the problems of irrigation.

The country needs the other bills—urgently, not as a matter of mere local development but as a national necessity.

PHOSPHATE ROCK "IN PLACE."

The need for the general development bill is not difficult to present. The lands of the Pacific coast are being used intensely in some parts and these lands call for fertilization. One of the elements which must be restored to the soil is phosphorus. This is native in most soils but is needed by all after long use. The orange orchards of California and the apple orchards of Oregon and Washington, not to speak of others, draw heavily upon the soil. And for its replenishing the orchardists are buying phosphate rock in Florida, which is carried 5,000 miles by water and then inland, while in Idaho, Montana, and Wyoming we have under withdrawal nearly 3,000,000 acres

of lands that are underlaid with phosphate rock. There is no law to-day under which this can be secured. In Montana and elsewhere throughout the West are smelters which produce the sulphuric acid necessary for the conversion of this rock into practicable fertilizer. So that the development of this industry waits only upon the passage of a law which will put this mineral at the command of those who need it.

Our coal lands are now subject to sale at appraised values based upon an estimate of the content of the land. This is at best an expert's guess, and converts each purchase into a gamble, both on the part of the Government and the purchaser. The bill does not exclude this method, but supplements it with a simple provision by which the purchaser, instead of buying at hazard, may pay a royalty upon what he produces. It gives the man of moderate means an opportunity to secure a mine.

THE OIL WELL AS A PLACER CLAIM.

As to oil and gas, the House committee had extensive hearings at which no practical man engaged in the industry offered any objection to the plan proposed. The existing law, under which such lands have been taken up, is to be characterized by no politer word than as a plain misfit. Oil is found hundreds and sometimes thousands of feet below the surface of the earth, yet the law applicable to its acquisition is the placer law, intended to apply to the recovery of superficial minerals. This law is of romantic origin, for it is the outgrowth of the experience of the Argonauts who went to California in the days of '49. The measures adopted by these men for the government of their claims along the mountain streams, where they did no more than lift the river sands to the pan or rocker, finally were incorporated into law. And the governing principle of this law was, that before a man could claim ownership in a placer claim he must have found gold there; and until he did, others might, at their bodily risk to be sure, attempt to make prior discovery. The utter inapplicability of such a principle to a mineral found perhaps 2,000 feet below the surface, and where the discovery must be made at a cost of twenty, fifty, or a hundred thousand dollars, is clear beyond comment. Now, under this impossible law a large amount of public land was "taken up," and by that is meant that it was located on and thereafter became a general basis for speculation, and sometimes was developed. That the law is as hazardous to the

investor as it is unsatisfactory to the Government is universally conceded, and in its stead should come a measure under which the Government would give a permit at first, an exclusive permit for drilling, and upon discovery within a given time an area be given as a reward for proving the ground, and adjacent lands leased upon a royalty basis.

AN INVALUABLE MINERAL.

There is another charge to be made against the existing law more serious than its unworkability. It is supremely wasteful. If the land is leased some control can be exercised over the manner of development. Millions of barrels of oil have been wasted by being allowed to flow into the streams, by being mixed with water or by evaporation. There has been no such waste, I am told, in any other mining. And petroleum is a priceless resource, for it can never be replaced. Trees can be grown again on the soil from which they have been taken. But how can petroleum be produced? It has taken the ages for nature to distill it in her subterranean laboratory. We do not even know her process. We may find a substitute for it, but have not yet. It is practically the one lubricant of the world to-day. Not a railroad wheel turns without its way being smoothed by it. We can make light and heat by hydroelectric power, but the great turbines move on bearings that are smothered in petroleum. From it we get the quick-exploding gas which is to the motor and the airship what air is to the human body. To industry, agriculture, commerce, and the pleasures of life petroleum is now essential. Therefore to waste it is a crime. An absolute government would prohibit a barrel of it being used for fuel before every drop of kerosene, gasoline, and other invaluable constituents have been taken from it. How much of it there is in the United States no one knows. The Geological Survey has made a maximum estimate of twenty-three billion barrels, which sounds like an inexhaustible supply. But at the rate that it is now being consumed in this country alone (265,000,000 barrels a year) this does not mean an indefinite supply, and from the rapid exhaustion of some fields it is manifest that there can be no real approximation of the oil in our lands. Whatever the supply, it should not be allowed in its crude state to compete with coal as fuel and the Government should not promote its being wasted by applying to it archaic laws under which waste is a certainty.

THE WITHDRAWN OIL LANDS.

There is one phase of the oil situation which should be most carefully considered. President Taft withdrew a large acreage in California and in Wyoming after much of it had been filed upon and after some development had been begun on a part of the lands. This withdrawal took place in September, 1909, and withdrew part of the lands for the benefit of the Navy as a fuel reserve and other of the lands were to be held awaiting appropriate legislation for their disposal. The total acreage withdrawn was 3,041,000 acres, of which perhaps one-half was then in private ownership. There was doubt at the time of these withdrawals as to their legality, there being no specific statute on the books authorizing the action. So serious was this doubt that as a precautionary measure Congress at its next session passed an act authorizing such withdrawals, and the same lands were subsequently, in July, 1910, withdrawn again. It was the opinion of many of the most competent members of the bar that the withdrawal of 1909 was void and the operators proceeded to act in accordance with this advice. The result was that when the second withdrawal, that of 1910, was made, there were a large number of operators engaged in drilling and some had already found oil on these lands. The Government insisted upon the validity of the 1909 withdrawal, and after failing to have its view sustained in the lower courts, was at last successful before the Supreme Court. So that to-day those who were not engaged in actual development of the lands at the time of the first withdrawal have no legal title to the lands. If the full measure of the Government's right is acted upon as a basis of our policy in dealing with these lands it will bankrupt many oil companies and do what appears to me to be an injustice and an unnecessary injustice to those who have invested many millions of dollars under a mistake as to the law. I shall not assume to say what policy should be followed as to the naval reserves, but as to the other withdrawn lands I believe Congress (which is the one forum wherein relief can be sought) should so act as to recognize the equitable rights of those operators. This might be done by saying that those who would to-day be entitled to patent were the land not withdrawn may have leases under which they will pay a liberal royalty to the Government. This plan will doubtless be urged. I am of the opinion that it is too liberal. We might draw a line at the time of the second withdrawal. If this were done,

leases could be made to all who were actually operating upon this land at that time. And if it is thought advisable, there could be imposed a higher royalty than would be called for under the general development bill. I feel that this is one of those situations often arising in the life of the individual and of the State when it is not wise to exact all that the law allows even as to those who are in the wrong.

TURNING WATER INTO POWER.

When Benjamin Franklin caught the lightning on the tail of his kite, he did a lot of strange things for this world, of which we are only beginning to learn. Among these are the uses to which flowing water may be put. The old-fashioned water wheel, which was the motive power of our early industries, is now converted into a turbine which generates electricity, and this has as great a variety of uses as the muscles of a man's arm or a horse's shoulder. Among the other strange things done by Benjamin Franklin was to give an added and peculiar value to the ledges of granite which confine our western streams and turn them into dam sites, useful for purposes of power generation. How many of these there are on public land not yet disposed of no one knows, but we have several hundred under withdrawal, which should be freed from withdrawal and turned into use just as quickly as possible; for, as the muscle of man or horse can raise a few barrels of water from the well to supply stock or irrigate the garden patch, so can the power of the stream, turned into electricity, be used to raise millions of barrels of water to irrigate alfalfa farms or orchards. And this is now one of the most common uses of electric power in the West, and, in fact, in some of the Eastern States where irrigation is found of value. The waters that flow down our streams are only a small portion of the rain and snow which fall. There are streams that follow their courses underground just as clearly marked and as valuable, if once discovered, as the streams above ground. And to tap these is a part of making America. Cheap gasoline is doing it in some places; cheap coal in a very few; but cheaper electricity is doing it in a large way. Then, too, there is that mystifying miracle of drawing nitrogen from the air for chemical use, which can be done only with great power, but is being done in Germany, Norway, Sweden, France, Switzerland, and elsewhere; by which an inexhaustible substitute

for the almost exhausted nitrates of Chili has been found. This is already a great industry in Europe, and will by necessity become greater in the United States than elsewhere, because of our size and need and opportunity. To increase the yield of our farms and to give us an independent and adequate supply of nitrogen for the explosives used in war, we must set water wheels at work that will fix nitrogen in lime. And there are still more intimate uses for this power—in places in Montana it is so cheap that it operates the churn, the sewing machine, and the vacuum cleaner, and supplies light to the house and fuel to the kitchen range. Indeed for the possible uses of electricity there is no measure.

Accompanying the general development bill in its passage through the House was a measure intended to promote hydroelectric development on public lands, named after the chairman of the Public Lands Committee of the House, Mr. Ferris. This bill was called for by the fact that existing legislation permitted only a revocable permit to be granted for such use, and this was regarded by engineers and financiers as too tentative and hazardous a tenure where millions of money were needed for the installation of the necessary plant.

The Ferris bill meets this difficulty by proposing a lease of these lands for a definite term of 50 years. The objection is made that the lands should be given outright. To this there are several answers of substance: No enlightened government gives such a franchise. There is danger, very real danger, too, of a complete monopolization of such power sites if the lands go forever from the people. The value of water power is not yet fully realized, and its full value can not be known at this stage in our industrial life. The purpose of the Government in transferring these lands is to secure their use, because it does not choose to use them itself, but the time may come when it may be most desirable to the full development of our life that they shall be operated by the Nation or the States or the municipalities in the States, and to transfer them forever would cast a burden upon the future which would be unforgivable, and is, moreover, unnecessary. The people desire these lands used, not held as a mere basis for speculation in stocks or bonds. Where there is need for such a plant the lands should be available on most generous terms.

At the end of the fifty-year period what becomes of the plant? If it has been so managed as to best serve the country there would be no

reason why the holding company should not have a new lease. If it had not been so managed the plant should be bought at its value by whoever the new lessee might be, or by those who took over the lands on which it was situated, the State, for instance. In other countries the plant is generally made to revert to the government at the end of the period without cost; and when it is realized that by establishing an amortization fund of one-half of 1 per cent each year the full expenditure can be refunded in 50 years, the difficulty of caring for the investment should not be insuperable.

The State owns the water, it is said, and should therefore command the right to the use of the land. This line of reasoning leads to an *impasse*. We are not considering rights, but what course is wise. Quite plainly the State can not command the use of the land and it is not proposed that the Nation shall command the use of the water, for no one can have the land at all unless he first gain the right to use the water from the State. We have given no other land to the State except for the sustaining of schools and colleges or for reclamation. If a State wishes coal land, it must buy it. The traditional policy of the Government has been to deal directly with the people in disposing of their domain.

The fear is expressed that by the imposition of charges for the use of the land an undue and unjust burden will be cast upon the people. The basis of this fear has not been discovered. Congress may, of course, if it so desires, fix absolutely the charge that shall be made, and if this were done the charge should be so low as to make the added burden upon the consumer, if any, an infinitesimal one; perhaps first a free period when no charge would be made, and then one-tenth of a mill per kilowatt hour for a period and two-tenths of a mill later.

As already said, with the passage of these two measures there will be no land or resource that will not be at the full service of the people. And yet the romantic enterprise of revealing America will not be done. To get from our resources their fullest use—this is our goal. And this is nothing less than a challenge to the capacity of a democracy.

There are many prosaic details involved in this quest. The mining men need a new set of mining laws, for instance. The old code is so elaborate and complicated that the best of brains can not tell what the law is. The truth seems to be that between mining engineers and mining lawyers the rules of the game have been refined into ob-

security. And if Congress were to say to the President that he might select three men familiar with mining laws and miners' difficulties to suggest a new mining code to Congress, it would, I believe, be giving in earnest a new freedom to the mining industry.

Then, too, there is the matter of the further development of Alaska. That land is a long way off. It would be too hazardous a thing to surrender these resources to local control or disposal, for those who have lived in any new country know how great the temptation is to grant away water front and power sites, forests, and other exceptional resources to those who come offering large sums for quick improvement. Yet this should not drive us into a policy that makes slow administration a necessity. The confusion in administrative action in Alaska is well known. I have tried to give it currency that it might hasten the establishment of some method of coordinated control of Alaskan affairs, primarily in the hands of a resident commission but always in touch with and responsive to the wish of Congress and the President through one of the departments. That land has a mysterious charm, a pull which affects all who see it and those, too, who only know indirectly of its largeness, its grandeur, and its economic possibilities. This could not be better illustrated than by the number of applications for places which were received by the Alaskan Engineering Commission. When that body left for Alaska in the spring the number was over 38,000, and most of those who applied were not out of work but already held positions with railroads, in banks, on farms, or in some city shop. They wished a taste of the large life of this new land. There are many more of the same desire, some of whom will make Alaska richer by their presence and find happiness in searching out the land. And strongly would I urge that the standpoint of the Government should continue one of sympathetic cooperation.

TAMING THE RIVERS FOR USE.

No one can survey the physical condition of the United States without being impressed and almost overwhelmed with the magnitude of the work that must be done in keeping our rivers within bounds and putting them to use. It is the largest task that the Government must undertake sooner or later, and the sooner in my judgment the better. This matter came immediately and most practically to my attention on a trip made in the late spring to the lower valley of the Colorado River. On the Arizona side of this river the

Government is reclaiming the desert. That lowland will grow almost anything, from dates to alfalfa. Its most helpful friend, and its unrelenting enemy, too, is the river itself, for without the river it would return to cactus and sage. Yet the river is so jealous of her freedom that she yearly attempts with violence, and by insidious methods as well, to reclaim for herself each foot of land that has by stealth been taken from her.

On the opposite side of the river, the California side, the river is held in by mountains, until it has reached the Mexican line. There, by a capricious turn, it deserts its old-accustomed channel and flows westward into what was once a lake, but is now little more than a morass, and so slowly finds its way to the Gulf of California. Immediately north of this westward bend in the river is the Imperial Valley, which has lately been used by several novelists to illustrate the heroic struggle of man with nature. For this valley was once a sea itself, and has indeed left a sort of rudimentary sea in a lake known as the Salton Sea. The fruitful soil of this valley, hundreds of feet deep, is the silt of the Colorado, the deposited wash of a thousand miles of mountain channel. Each June, when the snows of the Rockies melt, the Colorado, resenting the limitations which man has set up for it, presses with two strong shoulders against both sides of its prescribed banks, like Porthos under the slow caving of the earth. And as long as that flood comes the people on both sides must watch and work as the Hollanders have done.

There are two distinct and aggressive schools of thought on this matter of keeping the Colorado in its place. One is for sending the river willy-nilly down the old channel. The other is for letting the river live its own life, but keeping it off our preserves. One may be termed the absolutist theory and the other the democratic theory. Congress has thus far committed itself to the latter. And this year, when danger threatened, Congress joined in raising a fund to keep the river from forcing its way north into the Imperial Valley, and this work was successfully executed under this department by the former Chief of Engineers of the United States Army, Gen. W. L. Marshall. No one, however, believes that the work is at an end or that we have done more than put a good patch upon it.

Now, far above this point of danger there are thousands of square miles of land that need but the water of the Colorado River to make them as fruitful as the lands of the San Joaquin or the Salt River

Valley. We need to catch that water when it is young, soon after it has been born from the snows. There, in mountain valleys, it should be kept for a time and, as needed, led into the peaceful paths of usefulness. And on that problem the Reclamation Service is working. The difficulty is to find large reservoir areas.

This instance is cited to show how intimately the matter of flood control and of reclamation are bound together. The problem extends from sea to sea. When we come eastward, to the Missouri and the Mississippi for example, we find that in their upper reaches the lands need the waters, while in their lower reaches the lands must be saved from the waters.

No one can take the yearly toll of lives lost and of property destroyed by the furious and unrestrained sweep of our rivers without realizing that the people of this country can not regard themselves as owning this land, really possessing it, until they have brought these waters under subjection. And in doing this they will literally create new land by the millions of acres, lands that will support millions of people as against the thousands which live upon it to-day. And in saying this I am not speaking without authority, for a year ago we enjoyed the value of a visit from the renowned builder of the Assuan Dam, Sir William Willcocks, who has spent his life in India, Mesopotamia, and Egypt as a river tamer. And after he had seen our problem he sighed with regret that it might not be his fortune to see the day, that he said would surely come, when the valley of the Mississippi would be another valley of the Nile, only greater in area and more perfectly adapted to the white man's life.

WHY SHOULD THE WHOLE BURDEN BE BORNE TO-DAY?

How these great works can be carried on calls for constructive thought, not merely on the engineering side but more immediately upon the financial side as to those ways and means by which the lands reclaimed shall be made to bear in some degree the burden of the expense. As to the funds which will be needed, they mount into such figures as to be staggering. And I can see no hope that this work will be adequately undertaken without the Government advancing its credit and investing directly some of its own funds. We are conducting this Government from day to day out of current revenues. Only the richest of people could pursue such a policy. No private enterprise attempts it. No railroad system has been built

that way. But few of the States now construct their highway systems out of the year's revenues. The permanent improvements which the whole people undertake are a legitimate charge against capital account, not against maintenance. A commission to devise the ways and means by which the States and private land owners and the National Government can cooperate in paying for the work done seems to me a more needed body than one which will report upon engineering methods.

PLACES OF BEAUTY AS AN ASSET.

In casting up the assets of the United States as a landed proprietor I have made no mention of one of the most delightful of our national enterprises. To build a railroad, reclaim lands, give new impulse to enterprise, and offer new doors to ambitious capital—these are phases of the ever-widening life and activity of this Nation. The United States does more; it furnishes playgrounds to the people which are, we may modestly state, without any rivals in the world. Just as the cities are seeing the wisdom and the necessity of open spaces for the children, so with a very large view the Nation has been saving from its domain the rarest places of gradeur and beauty for the enjoyment of the world.

And this fact has been discovered by many only this year. Having an incentive in the expositions on the Pacific coast, and Europe being closed, thousands have for the first time crossed the continent and seen one or more of the national parks. That such mountains and glaciers, lakes and canyons, forests and waterfalls were to be found in this country was a revelation to many, who had heard but had not believed. It would appear from the experience of this year that the real awakening as to the value of these parks has at last been realized, and that those who have hitherto found themselves enticed by the beauty of the Alps and the Rhine and the soft loveliness of the valleys of France, may find equal if not more stimulating satisfaction in the mountains, rivers, and valleys which this Government has set apart for them and for all others.

It may reconcile those who think that money expended upon such luxuries is wasted—if any such there are—to be told that the sober-minded traffic men of the railroads estimate that this year more than a hundred million dollars usually spent in European travel was divided among the railroads, hotels, and their supporting enterprises in this country.

During the year a new national park of distinction and unusual accessibility has come into existence. It crosses the Rockies in Colorado at a point of supreme magnificence; hence its title, the Rocky Mountain National Park. Through it, from north to south, winds the Continental Divide—the Snowy Range in name and fact. Two hundred lakes grace this rocky paradise, and bear and bighorn inhabit its fastnesses. It has an area of 350 square miles and lies only 70 miles from Denver. Many hotels lie at the feet of these mountains and three railroads skirt their sides.

This is Colorado's second national park, the other being Mesa Verde, where this department, with the assistance of Dr. Jesse Walter Fewkes, of the Smithsonian Institution, has uncovered during the last summer prehistoric ruins of unprecedented scientific interest.

Oregon has but recently completed a great highway along the Columbia River. This should be connected by road with Mount Hood and a portion of the present forest reserve converted into a park. The limits of Sequoia Park, in California, the home of the great redwoods, should be so extended as to include the Kern River Canyon, a most practicable project to-day; but to-morrow may be too late, because of the lumber interests. The Grand Canyon is not yet part of the park system, although as part of a national forest it comes under the control of the Department of Agriculture.

There is no reason why this Nation should not make its public health and scenic domain as available to all its citizens as Switzerland and Italy make theirs. The aim is to open them thoroughly by road and trail and give access and accommodation to every degree of income. In this belief an effort has been made this year as never before to outfit the parks with new hotels which should make the visitor desire to linger rather than hasten on his journey. One hotel was built on Lake McDermott, in Glacier Park, one is to be built immediately on the shoulder of Mount Rainier, in Paradise Valley, another in the valley of the Yosemite, with an annex high overhead on Glacier Point, while more modest chalets are to be dotted about in the obscurer spots to make accessible the rarer beauties of the inner Yosemite. For with the new Tioga road, which, through the generosity of Mr. Stephen T. Mather and a few others, the Government has acquired, there is to be revealed a new Yosemite, which only John Muir and others of similar bent have seen. This is a Yosemite

far different from the quiet, incomparable valley. It is a land of forests, snow, and glaciers. From Mount Lyell one looks, as from an island, upon a tumbled sea of snowy peaks. Its lakes, many of which have never been fished, are alive with trout. And through it foams the Tuolumne River which in a mile drops a mile, a water spectacle destined to world celebrity. Meeting obstructions in its slanting rush, the water now and again rises nearly perpendicularly, forming upright foaming arcs sometimes 50 feet in height. These "water wheels," a dozen or more in number, will be accessible next summer by a trail to be built when the snow melts in June.

While as the years have passed we have been modestly developing the superb scenic possibilities of the Yellowstone, nature has made of it the largest and most populous game preserve in the Western Hemisphere. Its great size, its altitude, its vast wildernesses, its plentiful waters, its favorable conformation of rugged mountain and sheltered valley, and the nearly perfect protection afforded by the policy and the scientific care of the Government have made this park, since its inauguration in 1872, the natural and inevitable center of game conservation for this Nation. There is something of significance in this. It is the destiny of the national parks, if wisely controlled, to become the public laboratories of nature study for the Nation. And from them specimens may be distributed to the city and State preserves, as is now being done with the elk of the Yellowstone which are too abundant, and may be later with the antelope.

If Congress will but make the funds available for the construction of roads over which automobiles may travel with safety (for all the parks are now open to motors) and for trails to hunt out the hidden places of beauty and dignity, we may expect that year by year these parks will become a more precious possession of the people, holding them to the further discovery of America and making them still prouder of its resources, esthetic as well as material.

YOUNG AMERICA.

I turn now from young America, the land that is underdeveloped, to Young America, our twenty-two million school boys and girls; for these, after all, are our chief resource and our chief concern. Are we doing all possible to develop this resource?

If there is any one of our institutions in which the American people take undisguised pride and of which they feel justified in

boasting, it is the public school system, for this is "the greatest of American inventions" and the most successful social enterprise yet undertaken by any people. The United States maintains a Bureau of Education in this department, which, upon a small appropriation, collates as best it can the figures and facts which most inadequately tell the story of the growth and use of this most brilliantly conceived piece of governmental machinery.

The American people are not indifferent to their schools. Quite otherwise. They pay for their support almost as much as they do for the support of the entire Federal Government; in round numbers, three-quarters of a billion dollars a year, which keeps an army of 600,000 teachers at work. Education is indeed our foremost industry, from whatever point of view it may be regarded. Yet I am assured that it has made less progress than any of our other industries during the past 30 years. With all the marvelous record of what the mind of a quick people may produce to make life happier and nature more serviceable, how little can be shown as our contribution to the methods of improving the mind and skill of the young! We have gone to Europe—to Italy, Switzerland, Germany, and Denmark chiefly—for the new methods with which we have experimented, and Japan has found a way to instruct through the eyes and hands that will make these very practical people still more distinguished.

Yet here and there under rare leadership may be found in this country the most striking proofs of what can be done to tie our schools to our life. The hope is eventually to make the school what it should be, and easily may be made to be, the very heart of the community—social club and cooperative center as well as school.

There would seem to be nothing visionary in such a hope. To effect this evolution there is needed primarily leadership, and this the Government must give if it is to realize its desire for a people who are both skilled and happy. The spirit of our people is against a paternal government. We do not take with kindness to an authority that is mandatory. There is a sound belief that a people who make their own way are in the end riper and of stronger fibre than those who accept what is not the result of common determination. But this spirit of intense individualism does not make us independent of or indifferent to useful methods and helpful standards. And it is these that we can reveal. It is these that we should find and place

in service, rather than force the disconnected schools of the land to feel their way out or "muddle through." We may not command, but we may "show how." This is democracy's substitute for absolutism in the effort to secure efficiency. For such policy of helpfulness there is abundant precedent, not only in the action of Congress in making minor appropriations for the work of the Bureau of Education on precisely these lines, but in the activities of other departments. The country is dotted with experimental farms which prove soil values and the farmer of to-day is learning from the Government how great and all-embracing must be the knowledge necessary to the carrying on of his work, for he must know of chemistry, mechanics, markets and finance, transportation, and a world of things which his father or grandfather would have laughed at as the frills of a doctrinaire education, notwithstanding the early example of the wise and many-sided farmer who was the third President of this country.

I have said in a previous report that the Bureau of Education should either be abolished or put to serious high purpose. I believe the latter to be the wise, in fact the necessary, course. There is a real use for it. As in the Bureau of Mines we seek to save the lives of miners by educating them in the use of explosives and life-saving apparatus, and by instructing operators in safe methods of building their vast underground workshops, so I would erect the Bureau of Education into a Bureau of Educational Methods and Standards in which would be gathered the ripe fruit of all educational experiments upon which the schools of the country could draw. This is a wide country, and there is need for a national clearing house where can be centered and exchanged the results of the most remote experiments.

WHY NOT A RURAL SCHOOL CAMPAIGN?

There is no disguising the fact that we have a most difficult problem in the United States—and I can not believe it is ours alone—in the rural community. A majority of our school children are in rural schools. The query arises, Are our rural schools doing their part in making life in the country desirable? An ambitious people will go where education can be had for their children. There is no sense in talking of the charms of country life and the independence and dignity of producing from the soil if the school at command is no more modern than a wooden plow. The old-fashioned one-roomed

schoolhouse which holds 40 or 50 ungraded pupils, having but a single teacher who knows nothing but books, is not a modern institution, though great men have issued from its door. It may be all that the county can afford where many schools are maintained, but it is not all that the county can afford if schools are grouped and grades instituted. The richest State in the Union has over 4,000 schools of this character, wherein the teachers are paid less than competent farm hands, and this brings to mind the correlative thought that one needed reform in the school system is in the elevation of teaching into a real profession, as in older countries. As it is now, a teacher is almost without status in our society. And this, in addition to the inadequacy of the pay, has drawn to the profession those who use it only as a makeshift, and those who, out of a spirit of self-sacrifice and love for the work, serve in the highest way the public good. Of the former class we need fewer, and to the latter should come increasing honor.

How can the schools of a county be so coordinated and combined as to make them efficient tools? What should be the standard for a teacher's qualifications? How may children be brought to and taken from the school to distant homes at the least expense? To what extent should the teaching be out of doors and the "examples" those of real life? How can the boy learn that there is adventure in farm life as well as in the city?—for adventure he will have. To what uses may the school building be put as a community center for the neighborhood dance, lecture, or moving-picture show, or, perhaps, as the home of a cooperative buying or marketing organization? These are but a few of the questions which many men have tried to answer, and there have been some successful experiments made and right answers given.

But it is as hopeless a task for a local school board to find these answers as for a lawyer to know the decisions of all the courts. The teachers, the superintendents, and the school boards need leadership; they need an authoritative statement of conclusions by the wisest and most practical men in the land; they need to be shown the better way. And with even as little as a hundred thousand dollars a year for two or three years we could, I believe, conduct a campaign for a new kind of rural school that would work little less than a revolution in rural life. Our aim would be to identify the school with the farm and the

village, and develop a new respect in fathers and mothers for the school as a practical and not a mere scholastic institution. The problem is only one of popularization. The experimental work has been done. We know where the best seed is. Here is call for the cooperative leadership of the Government in a work of supreme value to the State. The man to direct this work should be one whose word the Nation would heed. That such a man can be secured there is no doubt, for experience justifies the statement that there are no men of large capacity whose services the country can not command at a material sacrifice.

If asked how this work could be done I should say that it could best be done by showing to the picked teachers of the country the model schools. The quickest and the surest way to set this country aflame with zeal for a better type of country school would be to show the teachers such schools, make them live in them, and learn from them by seeing them in action.

There is no such lesson as the one that is taught by experience. Lectures, moving pictures, and books may aid. But to see and be part of a movement or life is to make it one's own. If ten live men or women were taken from each State to some one of the two or three most modern rural schools and there for a month were initiated into the art of teaching out of life, by doing things and not reading about things being done, and if each of these ten went home a missionary for the new idea, how long would it be before the States were converted and old methods abandoned? And once the right kind of school were started in any State how long would it take others to follow? This thing can be done and by methods that are so simple and direct that they will be startling. The need is immediate, and surely it would be a shame to let a generation waste itself while the idea slowly creeps on all-fours through a country that has invented wireless telephony.

In this work the newspapers of the country could, and I feel assured would, give invaluable assistance. Not merely by the publicity given to the movement, but more definitely by helping in the

selection of the candidates for this opportunity, in sending them to these selected schools, and carrying on the campaign for putting what they have found into reality.

THE TEST OF A DEMOCRACY.

There is an evolution in a new nation's life quite as interesting as that in the life of a man. We pass through stages of development from the simple and earlier period when food is the one thing desired into the more elaborated and complex stages where first we begin to deal with the easily handled things and later reach the point where mind has a controlling part in all that is done. The pioneer builds his cabin and turns his cattle to graze upon the unfenced wilderness. He takes his water from the stream and makes his gun serve him with food and give him protection. It is not many years, however, before he has passed from herdsman to farmer, when soil must be plowed and seed sown. At first the one-horse plow will do, and any seed. But life grows more intense—society has gathered around, new demands are created—machinery must be used, seed must be selected, soil fertilized, credit obtained, markets sought, and the life of the simple herdsman has become complicated and broad. The gay recklessness of other days gives way to constant thought. So has it been with this country. For a long time we lived off the country's obvious supplies. Later we were producers of raw materials—grains and minerals, lumber and cotton. When manufacturing began it was of the larger, coarser things, which perhaps in their turn went abroad for higher fabricating. Now, however, we have come into the full tide of modern life when we seek for greater and more varied industries, wider markets, more economical methods of production and exchange. And in such a new time direction is needed, mutual and coordinated effort must be set up and the more elaborate machinery of organization put into service. Thought becomes the basis of the new life—hard, close, insistent, constructive thought, illuminated by knowledge and made practical by imagination.

I have reviewed some of the activities of this department that they may suggest how adequate to the task of efficient national development a democracy, even one so young, may be made to be. It has a foundation in the spirit and self-confidence of its people which no other government can have. There is needed but the crystalliz-

ing touch of coordinated action to make its success complete. To develop methods by which the energies of many individuals shall be brought to work together is the need. And as the method of doing this politically has been found in this Republic, so we may feel assured that economically and socially we shall not fail.

An intense nationalization has been the marking note of the past year. Each American has realized with keener consciousness the meaning of this land to him, and has sought for a larger view of it in its many aspects and, if possible, to gain a glimpse at its future. To each has come his dream. We know now that there is more to national feeling than pride in the possession of a land that is rare and valuable or the splendid memory of a history of struggle for those things of the spirit which men call principles. The highest sense of nationality comes with a sense of purpose—a sense of common purpose. In what direction are we consciously going? What are we determined that this land shall be? This, I take it, is the accepted test of a real national sense; and if it is, the obligations we must carry are certainly serious. For the United States is not yet ours in the proudest sense, and can not be until we are doing all that can be done to give to all its people and to the world the full expression of its highest intelligence applied alike to its resources and to the life of the people.

Respectfully yours,

FRANKLIN K. LANE,
Secretary.

The PRESIDENT.

ADMINISTRATIVE EFFORT.

GENERAL LAND OFFICE.

1. Patented under all classes of entries, 13,025,427 acres, as against 12,678,076 acres in 1913 and 10,135,475 acres in 1912.

2. Issued 2,711 patents on desert-land entries, embracing 448,752 acres, as against 2,127 patents, embracing 346,794 acres, during the year previous; 2,209 patents, embracing 356,477 acres, in 1913; and 2,285 patents, embracing 364,728 acres, in 1912.

3. Issued 1,669 patents in fee to Indians, relieving 202,050 acres from restrictions against alienation and rendering such acreage subject to taxation, as against 986 patents, embracing 122,432 acres, in 1913, and 1,051 patents, embracing 137,267 acres, in 1912.

4. Patented 146,079 acres under the Carey Act, as against 4,244 acres the year before and 35,170 acres in 1912–13.

5. Patented and certified under railroad and wagon-road grants, 1,624,142 acres, as against 828,911 acres in 1914, 1,340,998 acres in 1913, and 20,975 acres in 1912.

6. Allowed entries of public and Indian lands for 16,861,214 acres, as against 16,522,852 acres in 1914, 15,867,222 acres in 1913, and 14,574,688 acres in 1912.

7. Disposed of 2,943 applications for second entry, compared with 777 in 1914, 749 in 1913, and 837 in 1912.

8. Approved and accepted original surveys covering 11,988,387 acres and 2,350,962 acres of resurveys, an acreage largely in excess of accepted surveys in any year during the last two decades.

9. Surveyed and opened to entry 27,416 acres of Arkansas lands heretofore erroneously shown on the plats of survey as lake or sunk lands.

10. Reserved 23 town sites on the line of the new Government railroad in Alaska.

11. Laid out and surveyed town site of Anchorage, Alaska, and sold at public sale 655 town lots for $148,980, all within six months.

12. Disposed of 1,389 applications for rights of way for irrigation and kindred purposes, as compared with 898 of the same class the year previous.

13. Investigated 714 railroad rights of way under original action taken in the present year, of which 302 were declared forfeited for failure to construct the road.

14. Issued notices for the restoration of 2,838 lists of lands in national forests, by which approximately 280,000 acres of agricultural lands were opened to homestead entry, compared with 2,580 lists embracing 255,000 acres the year previous.

15. Restored to the public domain 530,841 acres as the result of investigations by the field service, as against 516,298 acres the year previous.

16. Sold 889 tracts of lands surveyed as villa sites, fronting on Flathead Lake, Mont., for $125,000, some tracts selling for $300 per acre. First sale of the kind in the disposition of public lands.

17. Settled and disposed of controversy of several years' standing, involving the exchange of over 400,000 acres of land in the Navajo and Moqui Indian Reservations, Ariz., for lands outside of said reservations.

18. Restored to settlement and entry after special investigation in the field 7,805 acres in the Imperial Valley, Cal.

19. Surveyed in the field under the Alaska coal leasing act of October 20, 1914, the coal lands in the Matanuska, Bering River, and Nenana coal fields, organizing therefor 15 field parties.

20. Restored from national forests during the period from March 14, 1913, to June 30, 1915, inclusive, 4,789,910 acres, as against 2,400,149 acres restored during the period from November 4, 1910, to March 3, 1913, inclusive.

21. Surveyed within railroad grants during 1914 and 1915 4,008,000 acres, as against 1,620,000 acres in 1912 and 1913.

THE INDIAN OFFICE.

1. Health conditions are considered of first importance. Six new hospitals were constructed during the past year in furtherance of a vigorous health campaign. Every Indian hospital bed not necessarily occupied with those suffering from disease or injury is being utilized for the Indian mother in childbirth. Education and protection of property are highly important, but everything is regarded secondary to the basic condition which makes for the perpetuation of the race.

2. The Indian Office has taken aggressive steps toward the development of improved vocational training, and has adopted plans in several of the boarding schools which will accomplish the educational training necessary to instill in the Indian youth the real object of educational equipment. Emphasis is being placed on agriculture and domestic science. This program will be carried out in all nonreservation and reservation boarding schools.

3. All Indian schools and reservations are being required to utilize every acre of available farm land for the production of the things they consume. Every effort is being put forth to the end that the Indians shall no longer be altogether consumers but shall become producers, thereby bringing about a corresponding reduction in congressional appropriations.

4. Through the use of the $600,000 reimbursable appropriation for the promotion of industry among Indians the Indian Office has been enabled to purchase equipment and establish on a sound and business-

like basis numerous Indian families on farms and through this system of loans promote the financial integrity and prosperity of the Indians participating in this fund.

5. The policy of promoting and developing the live-stock industry by the purchase of 2,678 stallions, 1,048 bulls, 12,272 heifers, 2,510 steers, 3,738 cows, 2,110 mares, 469 rams, 513 sheep, 670 horses, and 67 mules at an expense of one and a half million dollars, inaugurated during the year ending June 30, 1914, has been continued by the expenditure of a similar amount during the year ending June 30, 1915, in the purchase of 3,682 horses and mules, 72 stallions and jacks, 15,804 cows and heifers, 1,194 bulls, and a considerable number of other miscellaneous stock.

6. The increase in the number of Indian-owned stock has correspondingly decreased the areas of grazing ranges for lease. This condition, together with the advanced prices of beef, mutton, and wool and the great demand for horses and mules, has materially increased the number of bidders for Indian-reservation leases and has resulted in uniformly advanced prices for grazing privileges.

7. The number of acres farmed by the Indians has been greatly increased during the last year, more than three times the amount of seed having been distributed last spring than ever before.

8. Developed a new type of cotton of the long staple Egyptian variety, which has been given the name of "Pima," after the name of the Indian reservation in Arizona on which it was produced. Approximately $1,000,000 will be realized from this production during the year.

9. The greatest efforts are being put forth to induce the Indians to take advantage of the expenditures, totaling more than $12,000,000, for irrigation construction, which in the past on several projects have been almost unproductive. On many reservations the areas actually irrigated have been more than doubled in the year of this report.

10. For the first time an appropriation out of the Ute judgment fund was made for the benefit of the several tribes of Ute Indians. Since March 14, 1915, more than 20,000 acres on the Uintah Reservation has been placed under cultivation and the water rights thereby protected.

11. During the year the first real step toward a systematic and comprehensive inventory of the timber resources of the Indians has been taken.

12. The rules of probate procedure adopted by the county judges at the suggestion of the commissioner, afterwards promulgated by the Supreme Court, have in their enforcement resulted in the saving and safe investment of more than $1,000,000 during the last half of the fiscal year to the Indians of Oklahoma.

13. New regulations have been adopted to govern the leasing of the Osage lands for oil and gas purposes, which become effective in March of next year. Under these regulations the Osage Indians will receive one-sixth, and in some cases one-fifth, royalty instead of one-eighth on oil and one-sixth royalty on gas instead of a nominal payment on each producing well. They will also receive $1 per acre per annum on all undeveloped leased territory until the same is developed. Large tracts of producing territory under leases expiring March 16, 1916, will be leased on competitive bidding, from which it is expected a great sum of money will be realized. Improved drilling conditions have been adopted which will greatly diminish the waste in oil and gas throughout all Oklahoma.

THE BUREAU OF PENSIONS.

1. Paid for pensions $165,518,266.14

2. Returned to the Treasury $3,534,964.08 (including $53,230.22 repayments) of the amount appropriated by Congress for the payment of pensions.

3. Returned to the Treasury $190,296.46 of the sum appropriated for maintenance and expense of the pension system, including salaries of special examiners.

4. Reduced the number of employees by 93 persons without the necessity of dismissing or removing any employee. This was in addition to the reduction of the force by 145 persons for the preceding year.

5. Continued with increasing facility the payment of pensions without vouchers, enabling the pensioners to receive their checks earlier than under the former system and saving to such pensioners the cost of execution of vouchers.

6. Inaugurated an accounting system by which the exact status of the work of the bureau is ascertained and recorded every day, which has resulted in equalization of the work among the examiners, and elimination of idleness due to waiting for distribution of work.

7. Secured statements showing the marital status of about 350,000 male pensioners for use in the adjudication of widows' claims filed hereafter, and making permanent record of the history of these soldiers.

8. Convictions were obtained in 39 out of 40 criminal cases tried during the year because of violation of the pension laws.

9. By requiring pension claimants to make statement before the board of examining surgeons of all disabilities alleged to be due to service, a large reduction has been effected in the number of medical examinations ordered, the reason being that such a statement eliminates repeated applications by the same claimant based upon new disabilities. The amount expended for examining surgeons' fees in 1915 was $45,704.40, as against $128,206.17 in 1912.

THE PATENT OFFICE.

1. For the first time in years the office disposed of as many applications as were received, although the number of applications filed has not fallen off. During the years 1912 and 1913 there were filed 8,000 more applications per year than were disposed of.

2. The total number of applications awaiting action June 30, 1914, was 22,283. On June 30, 1915, there were 18,270, a decrease of 4,013.

3. The number of patents granted in 1914 was 38,225, and the number in 1915, 44,402, an increase of 6,177.

4. Caused a reduction in the number of interferences declared from 1,129 in 1914 to 916 in 1915—a decrease of 213.

THE BUREAU OF EDUCATION.

1. Inspected the work of 35 universities and colleges in North Carolina and Oregon at the request of the State superintendents of public instruction of those States; made a preliminary survey of higher institutions in the State of Washington; rendered decisions as to the eligibility of 402 universities, colleges, and schools for inclusion in the list of institutions to be accredited by the United States Military Academy.

2. Completed a digest of all the school laws of all the States.

3. Assisted committees of State legislatures in the preparation of proposed educational legislation; assisted in a survey of normal schools in Alabama.

4. Established a division of school and home gardening for the promotion of home gardening under the direction of the school. The plan advocated by the bureau has already been adopted by more than 100 superintendents.

5. Established a division of industrial education, with one specialist in industrial education and two specialists in home economics, for the promotion and investigation of various types of vocational education.

6. Completed the field work in the study of 575 schools for negroes.

7. Made studies of the provisions existing in various localities for the education of adult immigrants and assisted education officers in such localities in preparing plans for the elimination of illiteracy.

8. Prepared home reading courses for distribution to interested persons.

9. Prepared and put into operation a code of regulations for the self-government of the colony of natives at Metlakahtla, Alaska; procured the setting aside of two additional tracts of land as reservations for the natives of Alaska, one of the Kobuk River and another on Cook Inlet in southwestern Alaska; established two additional herds of reindeer, one at Atka and another on Annette Island.

THE GEOLOGICAL SURVEY.

1. Completed geologic and topographic surveys in United States, Alaska, and Hawaii aggregating nearly 112,000 square miles, an area larger than the State of Colorado. The items of increase over the work of the previous year include nearly 2,000 square miles more of detailed geologic mapping in the States and a net increase in Alaska of 5,000 square miles in the exploratory and reconnaissance topographic surveys as well as 1,400 square miles more of geologic surveys.

2. Continued the stream gaging at 1,350 stations in 41 States and Hawaii.

3. Classified about 23,000,000 acres of public lands, including action on 3,996 petitions for the designation of nonirrigable lands for entry under the enlarged homestead act. The area included in these designations is nearly 17,500,000 acres. The number of petitions from intending entrymen acted upon in the two last years, 9,395, is more than 5 times the number acted upon in the five years 1909–1913.

4. Furnished the General Land Office with reports containing specific information as to the mineral character or water resources of public lands on 10,150 cases other than the enlarged homestead petitions. This record of reports, which is a measure of the cooperation between the two bureaus, shows an increase of more than 1,000 cases over the number handled in a similar period three years ago.

5. Published reports—scientific, economic, and statistical—aggregating 23,574 pages, a notable increase over any preceding year. Of these and other Survey publications in stock 596,649 copies were distributed to the public. The plan of securing the assistance of postmasters in the sale of local topographic maps has been started this year.

6. Published a series of four guidebooks of the West, plainly written, in the effort to make the geologic descriptions of the country traversed readily understood by the average traveler. This is the begining of a definite movement to popularize the results of the scientific investigations of the Survey.

7. Issued for the first time a mid-year statement reviewing business conditions in the mining industry for the six-month period.

8. Prepared special bulletins to meet the demand for authoritative information concerning possible sources of mineral products hitherto imported; and conducted extensive correspondence bringing producers and consumers together. This special service to the public has been rendered with the definite purpose of helping to make America more independent industrially.

THE RECLAMATION SERVICE.

1. Added 110,000 acres to the area for which the service is prepared to supply irrigation water.

2. Irrigated over 750,000 acres, a larger area than that of cultivated or improved farm lands in Delaware and several times that in Rhode Island.

3. Furnished water to grow irrigated crops worth $16,500,000, equaling in value the annual crop production of New Hampshire.

4. Operated about 9,000 miles of canals, ditches, and drains.

5. Expended $15,000,000 in building reservoirs and other irrigation works.

6. Excavated 17,000,000 cubic yards of earth and rock, the equivalent in volume of a shaft to the center of the earth over 5 feet in diameter.

7. Constructed 753 miles of canals; 284 miles of waste-water ditches and open drains; 60 miles of irrigation and drainage pipe lines; 7,597 canal structures, including 747 bridges; 1,079 culverts and 311 flumes; 51 miles of roads; 178 miles of telephone lines; lined 54 miles of irrigation canals with concrete.

8. Placed three-fourths of a million cubic yards of concrete, sufficient to build a sidewalk 6 feet wide and 8 inches thick over 2,500 miles long.

9. Added to the capacity of its storage reservoirs over 1,000,000 acre-feet, making a total of 6,500,000 acre-feet, a volume that would cover the States of New Jersey and Delaware to a depth of 12 inches.

10. Manufactured 580,000 barrels of sand cement.

11. Brought practically to completion four large and interesting dams, as follows:

The highest dam in the world—the Arrowrock Dam in Idaho.

The dam empounding the largest quantity of water of any artificial reservoir in the word, except Gatun Lake—the Elephant Butte Dam in New Mexico.

The longest roller-crest dam in the United States—the Grand River Dam in Colorado.

The earthen dam with curved stepped spillways of concrete—the Lahontan Dam in Nevada.

12. Reorganized its field forces so as better to coordinate the work in widely scattered localities and improve the efficiency of the organization and economy in building and operating irrigation works. Established an executive office at Denver, Colo., centralizing the work of disbursing and purchasing for all reclamation projects.

THE BUREAU OF MINES.

1. Gave to the public a process, devised by one of the bureau's chemists, Dr. Walter F. Rittman, whereby refiners may obtain from crude oils 200 per cent more gasoline than was obtainable by old

methods, increasing the prospective life of every oil field, adding a vast sum to the national wealth, and perhaps assuring to automobile and motor-boat owners and all others using gasoline a cheaper fuel.

2. Also gave to the public a second process, devised by Dr. Rittman, whereby benzol and toluol, the first used largely as a base for the manufacture of synthetic dyes and the latter in the manufacture of high explosives, can be made from petroleum—processes which it is hoped may make this country independent of foreign sources of the supply of materials so vitally important to its industries. Its ultimate success means the ability of the United States to manufacture all the high explosives it might need in peace or in times of national stress, and also the establishment of a dyestuffs industry in this country.

3. Devised methods for the production of radium from the carnotite ores of Colorado and Utah at an average cost of $36,500 a gram, two-thirds cheaper than the market price of $120,000 asked by foreign producers, the new, cheaper methods making it much more certain that medical institutions will be able to procure a sufficient quantity of radium for the treatment of cancer and other malignant growths. With an adequate supply of radium for therapeutic use, it is intimated that the progress in the future in curing cancer will rival that made in wiping out diseases that once were prevalent. Physicians who have been enabled to make cures by reason of obtaining a greater quantity of the radium through Bureau of Mines methods, say that radium in cancer will prove an inestimable boon to man.

4. Continued its educational work among the more than a million miners of the United States as to safety, rescue, and first-aid methods, and has been rewarded with lessening death and injury rates, preserving miners to their wives, their children, and their homes. There were 3,193 fatalities in the coal and metal mines and quarries during the year 1914, as against 3,651 in the previous year, a decrease in the number of deaths of 458. In 1914 the death rate in these mines and quarries for each 1,000 men employed was 3.16, as compared with 3.49 in the previous year.

5. Developed rescue work throughout the mines of the country until it has resulted in the rescue of 200 men from mines after explosions or other disasters.

6. Induced manufacturers, by calling attention to the possible dangers attending the use of electricity in mines, to devise safer types of apparatus, especially electrical switches and motors, that can be used in gaseous atmospheres without danger of causing explosions by sparks and flashes with the usual attendant loss of life.

7. Investigated the health conditions in certain of the metal-mining districts where miners' consumption is prevalent to an almost

alarming degree, and where the death rate from this cause is sufficiently high to cause alarm, and has shown the operators and miners how, by the proper treatment of the rock dust, deaths from this cause may be almost totally stopped.

8. Informed operators and miners how the homes of miners can be made more comfortable and more sanitary, and has already witnessed its recommendations adopted by mining companies and construction concerns.

9. Informed the country how the mineral resources of the United States can be utilized to the greater benefit of the public and how the present losses and wastes in the mining and utilization of metals and minerals can be eliminated or minimized.

10. Has made a thorough scientific investigation of the causes of smoke from smelters, the damage done by such smoke, and has, as a result, brought about a better understanding between the mining companies and the farmers, and has suggested remedies which have led to an expenditure involving millions of dollars. This is a great step forward in a public nuisance which has already been costly to all parties in litigation.

11. Gave public better knowledge of the proper utilization of fuels, with the result that its work has served as a basis for improving equipment used to heat public buildings and for the development of improved types of power-plant furnaces and boilers, with a consequent saving in money spent for fuel.

12. Showed the country that the total annual loss to the petroleum industry through waste, a large part of which was preventable, amounted to $50,000,000, and as much as $10,000,000 in one State; cooperated with State officials and private organizations in efforts to bring about the enactment of laws that would lead to the adoption of less wasteful practices; investigated well-drilling methods and published and distributed descriptions of approved methods of drilling wells that encounter gas under high pressure and of extinguishing burning oil or gas wells; also devised and demonstrated a practical process for drilling through porous formations by which waste of gas in sands overlying oil sands can be stopped and the invasion and ruin of many gas and oil sands by water can be prevented.

THE NATIONAL PARKS.

1. Initiated additional hotel and camp facilities which enabled the national parks to successfully accommodate nearly two and one-half times as many visitors as in any previous year.

2. Executed long-term contract for development of Yosemite National Park on a profit-sharing basis with Government, concessioners to erect immediately two hotels, and thereafter, as rapidly as possible, camps and chalets in upper parts of the park.

3. Promoted similar development at Mount Rainier National Park which promises to afford service next summer.

4. Designed new and beautiful Yosemite village to gradually replace present shabby village; designed similar developments for other national parks including systems of chalets to be built at points and intervals convenient to travellers in automobiles or on foot.

5. Perfected comprehensive plans for furnishing public information on wide scale about the beauty and accessibility of National Parks with purpose of directing travel thereto.

6. Opened all roads in the Yellowstone National Park to automobiles.

7. Acquired title to old Tioga Road through Yosemite National Park and restored it by extensive repairs, thus opening up new and shorter automobile route across the Sierra; acquired title to the Big Oak Flat Road to and within Yosemite National Park and improved it.

8. Prepared preliminary plans for complete road and trail systems in Crater Lake, Sequoia, Glacier, Mount Rainier, and Yosemite National Parks.

9. Began important development of the eastern entrance to Yellowstone National Park and opened negotiations with railroads looking to interchange of routes which will enable transcontinental passengers to pass through park en route, entering and leaving same through any gates and by any railroads they may elect.

10. Opened to the public the new Rocky Mountain National Park covering superb scenic portion of Continental Divide in Colorado.

11. Extended automobile road to Paradise Valley in Mount Rainier National Park resulting in large increase in travel to and upon the glaciers. Surveyed road up Carbon River Canyon to open north side glaciers to public. Completed trail entirely around Mount Rainier, a distance of about a hundred miles.

12. Discovered and excavated a remarkable prehistoric structure in Mesa Verde National Park supposed to have been Pueblo fortress. Repaired and restored several prehistoric ruins.

13. Erected on the rim of the Grand Canyon of the Colorado River a rock memorial to John W. Powell, the original explorer of canyon.

14. Surveyed Mineral King Road to open up southern part of Sequoia National Park.

15. Established central purchasing agency for several western national parks.

16. Installed at Hot Springs Reservation a scientific system of mountain climbing known as the Oertel System of Graduated Exercises for benefit of persons under medical supervision.

ABSTRACTS OF REPORTS OF BUREAUS AND OTHER ADMINISTRATIVE UNITS OF THE DEPARTMENT.

OFFICE OF THE SOLICITOR.

The following table shows the receipt and disposal of matters received and disposed of in this office during the fiscal year ended June 30, 1915, which were docketed or recorded. It does not include a very large number of matters that are not formally docketed:

Work of office of the solicitor.

	Public lands.		Pensions.		Miscellaneous.[1]	Summary.
	Appeals.	On rehearing.	Appeals.	On rehearing.		
Pending July 1, 1914	2,218	101	3,111	.....	198	5,628
Received to June 30, 1915	2,420	751	3,133	69	17,569	23,942
Total	4,638	852	6,244	69	17,767	29,570
Disposed of	3,807	758	5,382	68	17,648	27,663
Pending July 1, 1915	831	94	862	1	119	1,907

[1] Under "Miscellaneous" are grouped such matters as "Disbarments," "Opinions," etc., as well as many other varied matters arising in the several bureaus of the department, and which, for one reason or another, may be referred to the Solicitor's Office for consideration.

The table of work of this office contained in each annual report, beginning with that of 1909, has been for the year ending October 1. The above table, therefore, covers a period of three months that were embraced in that of the last annual report. It is, however, a correct statement for the full period of the fiscal year, thus conforming to the intent of the report and other statistical tables contained therein. This change does not permit of most accurate comparison, but it may be noted that the matters thus docketed total 23,942 as against 26,877 for the year's period shown in the last report, while the number disposed of total 27,663 as compared with 25,041. Thus the total number of matters pending have been reduced from 5,140, October 1, 1914, to 1,907, July 1, 1915.

This very substantial reduction is due largely to the reorganization of the force in this office, the adoption of new and better methods for the handling and disposition of cases, and the creation by Congress of the Board of Appeals. Full credit is also due for the generous willingness of many of those engaged in the work to give extra hours to the accomplishment of the desired result.

In consequence, appealed cases, involving public lands and pensions, are assigned for consideration within a reasonable time after receipt, and they are adjudicated and disposed of promptly, although given more extended, and it is believed more thorough, consideration than under former methods. The earliest disposition of appeals consistent with careful and thorough consideration confers substantial benefit upon parties interested in public lands, pensions, etc., and others transacting business before the department.

In the courts sitting in the District of Columbia, 17 cases, in which the department has been made a party, have been disposed of during the last year. Of these, 3 were decided against the department. Only one adverse decision, however, is final. The other two are pending in higher courts. The 17 cases of which disposition has been made in some court were divided as follows: United States Supreme Court, 1; Court of Appeals, 3; Supreme Court District of Columbia, 13.

There are now pending 21 cases, distributed as follows: United States Supreme Court, 4; Court of Appeals, 3; Supreme Court District of Columbia, 14.

The volume and pressure of the general work is so great that the trial and disposition of cases in court is necessarily carried forward under considerable handicap.

GENERAL LAND OFFICE.

The total area of public and Indian lands originally entered and allowed during the fiscal year ended June 30, 1915, is 16,861,214.69 acres, an increase of 338,362.57 acres as compared with the area entered during the year 1914.

The area patented during the fiscal year is 13,025,427.976 acres, a decrease of 1,365,643.124 acres as compared with the fiscal year 1914. Of the above area 9,594,973.025 acres were patented under the homestead laws, a decrease of 405,661.975 acres, not including homesteads, and 32,360.89 acres patented as soldiers' additional entries.

The above patented area also includes the following: Enlarged homesteads, 3,972,381.16 acres; homesteads under the Kinkaid Act, 1,263,184.37 acres; with coal reservations, 1,435,071.80 acres. Area of Indian fee patents, not included in the above, 202,050.06 acres.

The total cash receipts for the sales of public land, including fees and commissions on both original and final entries, and sales of Government property in the local offices, for the fiscal year 1915, were $3,786,319.54 (1914, $4,256,102.96), a decrease of $469,783.42. Miscellaneous receipts were as follows: From sales of Indian lands, $1,556,630.97 (1914, $1,884,802.77); depredations on public lands, $31,203.54; depredations on Indian lands, $38.33; leases, power sites,

etc., act of February 15, 1901, $1,116.21; copies of records, plats, etc., made at General Land Office, $14,738.82, and at 13 surveyors general's offices, $4,900.79; making the aggregate cash receipts of this bureau during the fiscal year 1915, $5,394,948.20 (1914, $6,148,367.63), a decrease of $753,419.43.

The total expenses of district land offices for salaries and commissions of registers and receivers, and incidental expense during the fiscal year ended June 30, 1915, were $828,865.71, a decrease of $24,832.89. The aggregate expenditures and estimated liabilities of the public land service, including expenses of district land offices and surveys made, were $3,008,996.31, leaving a net surplus of $2,384,922.61 of receipts over expenditures.

Field service.—Notwithstanding a 10 per cent decrease in the field force, made necessary by the reduction of the appropriation, the number of cases pending investigation was reduced nearly 2,000 from that pending at the beginning of the year. Over 20,000 cases were investigated.

Reports are now coming in which will afford a basis for definite action by this office on cases pending in the California oil fields. It is anticipated that within a few months reports will be received on nearly all the pending cases. The investigating force has been still further increased over that maintained last year. Six suits had been brought to recover for trespass on oil lands committed in violation of Executive withdrawal orders. In most of those cases operations have been continued under receiverships, and in some instances the business has been operated more advantageously than under claimants' own operations.

Fifteen contracts have been entered into permitting the disposition of oil and gas produced from withdrawn oil lands which are embraced in application for patent. These contracts are authorized by the act of August 25, 1914 (38 Stat., 708). The form of contract adopted is simple and practical. The contract is clear in its terms and free from hampering and technical restrictions, yet the interests of the Government are amply protected. The portion of the gross proceeds of sales of the oil which is released to the operator is regarded as equaling the expense of operation plus a fair return upon the investment.

Public surveys.—The aggregate acreage of accepted surveys for the year past is greatly in excess of that of previous years, being much larger than in any year within the last two decades, the figures showing an area of accepted original surveys of 11,988,387 acres and 2,350,962 acres of resurveys.

In handling resurveys the office has adopted a new procedure under which a more specific showing for the necessity of such survey

is required. This plan works no hardship where the applications are of a meritorious character and serves to eliminate the expense of field examination.

The progress of surveys within railroad land grants is extremely gratifying. Approximately 3,000,000 acres were surveyed, employing 43 surveying parties.

During the year past a satisfactory conclusion to the long-standing controversy over the identification of lands lying north of the third standard parallel in Imperial Valley has been accomplished. In addition to this, to the west of and adjoining Imperial Valley, resurveys were commenced under departmental authorization of January 26, 1915, and the resurvey of about 90,000 acres accomplished, while to the east of and adjoining the valley resurveys covering 190,000 acres were made under departmental order of February 13, 1915.

Fragmentary surveys, embracing areas of all sorts and kinds of various quantities, involve so many questions of complicated character that one of the supervisors of surveys has been detailed to this special duty, resulting in bringing this class of surveys up to date.

Alaska.—The coal-land surveys made necessary under the act of October 20, 1914 (38 Stat., 741), as a preliminary to the leasing of coal lands in the Territory, have been prosecuted vigorously under a comprehensive field system, by which it is expected to complete during the present season all field work as to the coal areas in the Matanuska, Bering River, and Nenana coal fields.

During the fiscal year public-land surveys were extended over 90,000 acres of agricultural lands in the Cook Inlet district, northeasterly of Knik.

Reviewing the situation in the Territory, it is recommended that Congress be asked for a special appropriation of $50,000 for the survey of public lands in Alaska, to be made continuously available until expended.

Free permits for coal mining of small areas for purely local needs are granted under section 10 of the coal-leasing act, and in pursuance thereof regulations have been adopted under which a number of these permits have already been given.

Supplemental patents.—Under the act of Congress of April 14, 1914 (38 Stat., 355), there have been issued 1,227 supplemental patents in cases where the original patent reserved to the United States the coal deposit in the land, and such lands were subsequently classified as noncoal in character.

Homestead and kindred entries.—During the year past there were approved for patent 41,291 homestead entries, 794 timber and stone entries, 2,830 sales of isolated tracts, and 919 miscellaneous cash sales.

The preferred right of entry under the enlarged homestead act accorded applicants for undesignated lands by the amendatory act of March 4, 1915 (38 Stat., 1162), has met with a remarkable response, there having been filed under the provisions of this act up to the 1st of September 6,621 applications.

Reclamation homesteads.—Notation is made of the fact that farm units embracing areas reasonably required for the support of one family have been established in 19 of the reclamation projects.

In addition to the projects being constructed under the provisions of the general reclamation act, several other projects upon Indian reservations are being constructed, under the provisions of the act applicable to such projects alone.

Ceded Chippewa lands.—There has been no opening to homestead settlement and entry of lands classified as agricultural in the ceded Chippewa Reservation since 1911, due to some necessary changes of Indian allotments.

The next opening will take place as soon as practicable, and will include about 50,000 acres of "cut-over" lands and about 4,850 acres of "pine" lands.

Minnesota drainage entries.—During the past year there were approved for patent 517 entries under the Minnesota drainage law, known as the Volstead Act, as against 245 for the preceding year. Serious difficulties in the administration of this law is noted, due to differences of views entertained by the State and the department as to the provisions of the statute.

Homesteads in national forests.—In the year past notices were issued under the act of June 11, 1906 (34 Stat., 233), of the restoration of 2,838 lists of lands in national forests, by which approximately 280,000 acres of agricultural lands were opened to settlement and entry.

Chippewa Indian timber logging.—The twelfth year of logging on ceded Chippewa lands closed June 30 last, and during said year there were cut and removed 46,272,950 feet of timber, valued at $373,442.73. Some falling off in logging is noted, due to the dullness in the lumber market, on which account some of the contractors obtained extensions of time to complete their cutting.

Abandoned military reservations.—Field work in connection with the survey and classification of the lands in the Fort Assinniboine Military Reservation has been completed, but the office work will not be finished for some time, so that it is impracticable to have an opening before next spring.

Plats of the survey of Fort Grant abandoned reservation have been approved, showing about 13,000 acres. Nearly 4,000 acres are included in grants to the State of Arizona. The remainder are to be appraised prior to their public offering.

Town-site and kindred entries.—Lots in 9 town sites were offered for sale at public auction during the months of June and July, 1914, resulting in the sale of more than 1,000 lots, for a sum in excess of $80,000. The sale of lots in town sites upon public lands in all cases has resulted in prices largely in excess of the appraised valuation.

The town of Anchorage, Alaska, on the Government railroad, was surveyed; 655 lots were sold in July at public sale for the sum of $148,980.

Flathead Indian lands.—The failure to secure, through congressional action, relief for settlers who were insisting upon a reappraisal of farm values, is noted, together with the fact that in the meantime action affecting these lands is suspended.

Regulations for the sale and removal of timber from lands classified as timber lands and the subsequent appraisal and opening of such lands to homestead entry have been approved.

Notices issued for the sale during August of 78,116 acres of agricultural lands under the act of April 23, 1904, and for 46,635 acres of barren and burnt-over lands.

Indian allotments.—During the past year 2,324 trust patents issued embracing 284,713.33 acres of land. During the same year 1,699 patents were issued conveying title in fee to Indians found competent to assume charge of their own affairs and to purchasers of allotted lands. The issuance of these fee patents operated to relieve 202,050 acres of land from restriction against alienation and rendered that amount of land subject to taxation.

Flathead villa sites.—Tracts set aside as villa sites under the act of April 12, 1910 (36 Stat., 296), were offered for sale at public auction during July and August. There were 889 parcels of land, not less than 2 nor more than 5 acres in area, fronting on Flathead Lake, subject to sale for the minimum price of $10 per acre. These lands, having a minimum valuation of less than $35,000, sold for approximately $125,000, some tracts bringing about $300 per acre. A general law authorizing the entry of public lands in the form of villa sites is recommended.

Railroad grants.—The total area certified and patented under railroad and wagon-road grants was 1,624,142.27 acres. In the adjustment of railroad grants, the adjudication of Carey Act propositions, and right-of-way applications, the work of the past year has been exceedingly satisfactory. There were finally adjudicated and closed 5,065 cases of all kinds, as against 4,245 cases of the year previous.

Rights of way.—Substantial progress has been made in the past year in clearing the records of approved railroad rights of way, where the roads have not been constructed, and requiring proof of construction in other cases. During the year 714 railroad right-of-way

grants have been investigated. Of these, 302 were declared to be forfeited under the several forfeiture acts; in the remainder of the cases the grantees were called upon to show cause why the grants should not be declared forfeited for failure to file evidence of construction.

In this line of work the following States have been fully covered: Washington, Oregon, California, Idaho, Nevada, Arizona, New Mexico, Montana, and Wyoming.

Power-site reserves.—During the past year 56 withdrawals were made for this purpose, covering 292,134 acres. Of lands theretofore withdrawn, 55,646 acres were restored. At the end of the fiscal year 2,228,105 acres were included in withdrawals for power sites and 182,653 acres as public-water reserves.

State desert-land segregation.—A marked increase of work under Carey Act segregations is noted for the past year. Applications for withdrawal under the act of March 15, 1910, covering 1,048,654.80 acres were finally disposed of, as against 315,209 acres during the year previous.

Segregation lists to the amount of 108,464 acres were acted upon, as against 15,069 acres in 1914.

Patents were issued under Carey Act projects during the past year for 146,079 acres, as against 4,244 acres the year previous.

Desert-land entries.—Radical changes were made during the past year in the regulations under which desert-land entries are allowed, by which all applications are referred for a field examination as to feasibility prior to final action. For the relief of those who had made entries but could secure no adequate water supply the Land Department recommended, and Congress passed, the act of March 4, 1915 (38 Stat., 1138). The necessity for a change in regulations and the remedial legislation is apparent from the fact that during the past two years upwards of 5,000 applications for extension of time within which to submit final proof have been considered wherein the claimants were unable to secure water for the irrigation of their lands within the period prescribed by law.

The amendment of the desert-land law by which entries shall be restricted to 160 acres is recommended.

During the past fiscal year 2,711 desert-land entries were patented, embracing 488,752.80 acres, as against 2,127 entries, embracing 346,794.74 acres during the prior year.

Irrigation projects.—Under the practice now in vogue irrigation projects alleged as sources of water supply in the case of desert-land entries are investigated in the field, wherein the examination covers all engineering features of the project involved. A study of the stream system is made, together with the adequacy and permanency of the water supply, construction and maintenance, the financial

ability of the organizers, the feasibility of the main system, the methods for water distribution, the title of the water supply, the character of the lands to be irrigated, and the duty of the water proposed to be utilized.

This work is not only for the protection of the interests of the Government, but also that of public-land claimants, inasmuch as it discourages the construction of projects without full information on the vital matters concerned and tends to prevent the promotion of fraudulent enterprises. During the past year 253 reports of this character have been disposed of by this office, favorable action having been taken on 167 projects, adverse action on 58, and 28 cases closed without definite action.

State selections.—During the past fiscal year 16,277.38 acres of indemnity school-land selections and 840,606.36 acres of selections under grants in quantity for specific purposes received departmental approval and have been certified to the States making such selections.

Swamp and overflowed lands.—A statement is submitted showing the acreage patented to the several States as beneficiaries under the swamp-land grant, amounting in total to 63,832,583.06 acres. The same States received as cash indemnity under amendatory acts the sum of $2,095,468.79 and land indemnity to the extent of 743,939.39 acres. A study of the swamp grant and the manner in which the trust has been administered by the several States by whom it was received leads to the conclusion that none of the large land grants made by Congress has more completely failed of its purpose, in this that the proceeds of this grant have not been applied to secure the reclamation of the land, as was the intent of Congress. For this reason, and the further one that with the lapse of time the adjustment of the grant becomes more and more difficult, it is recommended that Congress enact legislation declaring that after a date fixed, preferably six months after the bill becomes a law, no new claims to swamp and overflowed lands be received or recognized by the Land Department.

Patents for 19,219.63 acres of swamp and overflowed lands and 252.32 acres of swamp-indemnity lands were issued, and claims aggregating 16,639.71 acres were rejected during the past year.

National forests.—Since the issuance of the last annual report, 12 national forests have been reduced. Certain inter-forest transfers have been made involving three national forests, and the Zuni National Forest, Arizona and New Mexico, has been consolidated with the Manzano National Forest. There are now 162 national forests, embracing 184,240,596 acres, of which area approximately 89 per cent is public land. The decrease in area of national forests since the beginning of the fiscal year is 1,080,606 acres.

During the fiscal year the public lands subject to disposition in 1,277,536 acres, excluded from national forests in this and previous years, have been restored to settlement and entry.

During the past year nine administrative stations, embracing 1,742 acres and 1 right of way, have been withdrawn, and 365 withdrawals for such purposes revoked, covering 62,251 acres. There are now 25 rights of way for wagon roads and 2,777 administrative sites withdrawn, embracing 352,689 acres.

Contest work.—The gradual reduction in the area of the public domain has not resulted in the diminution of litigated claims before the Land Department. In the year past 1,421 decisions were rendered on cases coming before the office on appeal.

Repayments.—There were stated during the last fiscal year 1,689 accounts, allowing repayment of $305,310.83, and during said period there were denied 799 claims. This number of claims allowed and the amount repaid includes 42 accounts, allowing repayment of $147,825.14 received in connection with pending claims for coal lands in Alaska and repaid under section 3 of the act of October 20, 1914 (38 Stat., 741).

State development.—The commissioner submits a compilation of the public-land grants made to a number of the States, illustrative of the care taken by the National Government to secure the permanent establishment of our free institutions in the new States, on their admission to the Union.

Recent legislation.—A brief summary of the legislative enactments of the Sixty-third Congress affecting the public domain is included in the commissioner's report, together with a similar statement of proposed legislation, receiving the approval of the Land Department, but failing of enactment.

Homestead law.—A study has been made in the General Land Office to determine the actual investment made by homestead entrymen prior to final proof, as well as the extent of cultivation. The requisite data was secured by a compilation from the final proofs submitted on 10 homestead entries, taken at random from each of the 95 districts of the public-land States, in comparatively recent cases, by which it was found that a total of 26,297 acres were cultivated in the entire 950 claims, and the total value of the improvements placed thereon estimated at $751,151. The average cultivation thus disclosed is 27 acres, and the average value of improvements thereon $790. This is regarded as a fair demonstration of the general good faith of claimants under the homestead law.

Needed legislation.—The commissioner invites attention to legislative needs in the matter of:

(1) A special appropriation for surveys in Alaska.

(2) Repeal of the swamp grant.

(3) Consolidation of the various right of way acts.

(4) A legislative definition as to the public-land laws applicable in Alaska.

(5) Amendatory legislation with respect to the disposition of title conferred under right of way acts, in the event of subsequent abandonment or forfeiture of such rights of way.

INDIAN AFFAIRS.

The Indian Bureau has laid great emphasis on its industrial program, and its achievements along this line stand out prominently, and the year has witnessed a marked advancement for the betterment of conditions under which the Indians shall be led to self-support.

Educational facilities and opportunities.—Beginning in the schools, stress has been laid on industrial and vocational training. At the Carlisle School a plan has been developed promoting special training along these lines, cutting off here and there the superficial and enlarging on the practical subjects. As the plan thus outlined is successfully developed at Carlisle, it will be extended to the other Indian schools. It is interesting to note that 19 Indian boys have been placed in the Ford Motor Co. establishment at Detroit, where they will receive actual industrial training.

In connection with Indian schools, the largest possible use has been made of the public schools in the several States convenient to the Indian population, and the attendance of Indian pupils in the public schools has been greatly increased during the past year, in many instances without drawing on the appropriation of $20,000 provided by Congress for the payment of Indian pupil tuition in those States where the public schools are not otherwise available to Indian pupils. When necessary, and in localities where large nontaxable Indian population reside, recourse has been made to this appropriation.

In the past attention has been given principally in an educational way to those Indians residing on reservations where they come closely in contact with the white population, and the field has been fairly well covered by the establishment of nonreservation schools for the more advanced pupils, boarding schools, and reservation day schools; and this applies, as a rule, to the entire Indian population, excepting the Navajos and Papagos in Arizona. Schools are being constructed in the Navajo country, and educational facilities of an average character are being given to these Indians.

The Papagos occupy a territory practically 120 miles long by 90 miles wide and extending from Tucson, Ariz., westwardly nearly to the Colorado River, and southerly from the line of the Southern Pacific Railroad to the northern boundary of Mexico. Scattered over this territory are approximately 6,000 Indians, the population

centering around 20 widely separated villages. This population has received little or no attention from the Government and practically no facilities for education. There has been expended for these Indians during the year $50,000 in the erection of school buildings at seven of these villages, and it is purposed to promote their education in an aggressive manner.

Health conditions.—With regard to the health of the Indians, it is shown that there are employed, approximately, 200 physicians. During the past year there were constructed six new hospitals, and plans have been made for the erection of others as rapidly as funds will permit. A vigorous campaign is being waged for the eradication of tuberculosis and trachoma, the two principal diseases with which the Indian population is afflicted. In conjunction with the hospitals for the treatment of the serious cases, the construction of school buildings is so planned that there will be available outdoor sleeping accommodations for the pupils for the promotion of the health of the children and to aid in the suppression and inroads of tuberculosis among the younger population.

Promotion of farming industry.—It is noticed that there has been a marked increase in the number of Indians engaging in farming, and that further increase is measured principally by the ability of the bureau to furnish the necessary equipment. Much good has resulted from the agricultural fairs which have been held on the various reservations, stimulating among the Indians a healthy desire to compete successfully with their white neighbors. At some of the State fairs the Indians have successfully competed with the whites and have carried off some of the principal prizes. The farms connected with the several schools on the reservation have been practically converted into demonstration and experimental stations, and at each one farming is made an object lesson for the surrounding Indian community.

It is in connection with the promotion of the farming industry that the reimbursable fund, so called, is used to splendid purpose. There was appropriated by Congress at each of the past two sessions $600,000 to be used in promoting industry among the Indians. From this fund farming equipment is purchased and sold to the Indians on credit. The system has worked out successfully and has promoted financial integrity among the Indians, and has demonstrated that they possess the highest conscientious qualities. In some instances the Indians paid for this equipment before it was due under the contract, and no losses have yet been noted. Aside from the farming equipment, and probably to a greater degree, this fund has been used in the purchase of live stock, and on reservations principally valuable for grazing purposes there have been placed herds of tribal cattle, thus permitting the Indians to utilize the resources of the reservations for their own benefit. It has heretofore been the policy

to lease large areas of these reservations to white stock raisers, the Indians profiting only through per capita payments made from the lease moneys. The Indian Bureau looks with disfavor on per capita payments and discourages it, except where such payments are mandatory by law, or where the payments would manifestly promote the Indians' industrial advancement. The placing of tribal herds on Indian reservations has materially lessened the area to be leased by white stock raisers. The loss to the Indians, however, is not in the exact proportion of the area to be leased, as it is found that the demand for pasturage lands increases in proportion as the area to be leased diminishes, and where permits were formerly granted for $1.50 per head the Indians are now receiving from $2 to $2.50 per head.

At the Sacaton Experimentation Farm in southern Arizona, located on the Pima Indian Reservation, there has been developed a new type of cotton of the long staple Egyptian variety. This new type is extra fine, and has been given the name of "Pima." The whites in the locality, as well as the Indians, have been planting this grade of cotton, and last year there were received for the product approximately $1,000,000. It has been shown that the climate and soil in the vicinity of the Pima Indian Reservation, in Arizona, are particularly well adapted for cotton growing, and it is gratifying to note that the Indians have developed a new type, which is equal, if not superior, to the best produced in the world.

Improvement in home conditions.—Improvement in home conditions is reported by the Indian Bureau. Plans of model houses have been prepared and introduced on the several reservations, and in the construction of houses for Indians from the reimbursable appropriation, where the Indians pay for the house as they procure funds, the new type of house is introduced. The cost of these houses varies from $400 to $600, according to locality and accessibility of lumber markets.

Irrigation of Indian lands.—On the Uintah and Ouray Indian Reservation, in Utah, there are thousands of acres of irrigable land, which have been allotted to the Indians and on which have been constructed irrigation systems. The Ute Indians are not among the more progressive type, and it has been a problem to the Indian Bureau how to induce these Indians to engage in agricultural pursuits. In addition there is danger of losing the water rights attached to these lands through nonuse under the State laws. To overcome this discouraging outlook vigorous efforts are being made to place these lands under cultivation and make beneficial use of the available water. To this end over $300,000 has been set aside from what is known as the "Ute judgment fund." This fund arose through a judgment in favor of the Ute Indians against the United States for $3,000,000, and the money

belongs to the different tribes of Utes, of which those under the Uintah and Ouray Agency have the largest share. The allotments are being leveled and prepared for water under the supervision of the superintendent, and where possible the lands are being leased to white settlers on the lowest and most advantageous terms. It is hoped in this way to bring into cultivation a very considerable part of the thousands of acres of irrigable land on this reservation.

Among the most important agencies for the industrial advancement of the Indians are the various irrigation projects. More than one-fourth of the whole Indian population reside upon reservations with an insufficient rainfall to make possible successful agriculture.

Approximately 400,000 acres are now irrigable through works already constructed upon more than 60 reservations, but this area is only a small part of that which must eventually be provided to allow all the Indians of these reservations means of self-support.

Investigations have been made of possible additional irrigation projects, notably on the Colville, Southern Ute, Western Shoshone, Wind River, Gila River, and several other reservations.

Especial attention has also been given to improving the water supply for the Navajo and Papago Indians, thereby greatly aiding the cattle and sheep industries upon which these thrifty peoples depend.

There has been a notable increase in the utilization of irrigation facilities by the Indians of the various reservations. The Indian Service is emphasizing industrial activities and employing effective means to arouse an interest in farming by even those tribes which have heretofore neglected their opportunities. Among the reservations upon which have been gratifying progress in area actually irrigated are Yuma, Crow, Uintah, Wind River, Klamath, Gila River, and many others.

The rapid enlargement of the irrigated area not only increases the ability of the Indians to become useful, self-supporting citizens, and makes productive the large expenditures for irrigation construction which have in the past been only partially utilized, but also more thoroughly establishes the Indian ownership of the valuable water rights upon the possession of which the protection of the various investments for irrigation depends.

The questions connected with water rights here suggested have been the subject of earnest study and upon several of the reservations exhaustive and extensive investigations have been carried on under the supervision of both legal and engineering experts. The importance of this work can be realized when it is remembered that the value to the Government of the expenditures already made of more than $12,000,000, and even the continued existence of the In-

dians upon these reservations depends upon the proper safeguarding of the ownership of the water supply for these irrigation projects.

Although the fire risk on Indian forests during the past year was very high because of unusual meteorological conditions in the Northwest, the situation was effectively controlled and the actual loss from fire was relatively slight. During the year the first real step toward a systematic and comprehensive inventory of the timber resources of the Indians has been taken. On the Quinaielt, Klamath, and Menominee reservations parties have been engaged in examinations which contemplate not only detailed estimates of the stands of timber but also the preparation of reliable contour maps as a basis for the administration of the timber lands. The timber resources on these three reservations are very extensive. The Indian Service plans to extend the work to other reservations during 1916.

Improvement of liquor situation.—The liquor situation is reported as improving through the active campaign which has been carried forward against this traffic on Indian reservations and in the Indian country. The Indians themselves seem to be aroused to the evil effects of the use of intoxicants, which is evidenced by the fact that at several large gatherings of Indians during the past year no liquor of any kind could be obtained. This is particularly pleasing, in view of the fact that heretofore it has been common that such Indian gatherings were associated with much drunkenness. The wave of reform in the use of intoxicants, which has been spreading over the whole country, seems to have reached the Indian reservations.

Oil and gas industry in Oklahoma.—The oil and gas industry in Oklahoma has a wide bearing on that industry as it affects the Nation at large. The production was so enormous during the past year as apparently to affect the price throughout the Nation, and difficulty was experienced in properly caring for its transportation and storage. The price of crude oil fell to as low as 40 cents per barrel, but at this writing, owing to the decrease in production, prices have advanced to 75 cents per barrel. These prices refer to the Mid-Continent oil field, the grade being somewhat higher than that of the Healdton field. The production for the past fiscal year in Oklahoma was approximately 34,654,645 barrels, valued at $3,180,816.

In the Osage Reservation the proven oil lands are covered by what is known as the "Foster lease," embracing 680,000 acres. By its terms this lease expires in March of next year. Last year there were produced from these lands a total of 7,476,209 barrels, from which the Osage Indians received royalty in the sum of $560,155.62. The leasing of this area, after the expiration of the Foster lease, has been the subject of conference with the Osage Indians through their council and this department, and on August 26 there were approved regu-

lations governing the leasing of lands in the Osage Reservation for oil and gas. Under these regulations royalty has been fixed at 16⅔ per cent of the gross proceeds from sales, after deducting oil used for fuel. The gas is subject to the payment of royalty at the same rate.

In connection with the probate work in the Five Civilized Tribes in Oklahoma, it is noted that there were 53,433 cases, of which there were disposed of during the year about 1,400. The attorneys appeared in over 10,000 cases, and instituted 213 civil actions, involving $1,525,000, and 37 criminal actions.

Distinction between Indian citizen and white citizen.—The distinction between the Indian citizen and the white citizen lies mainly in the exercise of the function of governmental supervision. That some Indians, both citizen and noncitizen, are as fully qualified to manage their own affairs as the average white citizen, is patent to everyone claiming the least knowledge of Indian matters. For the purpose of determining what Indians belong to the competent class, and thereby entitled to assume full control of their property freed from governmental supervision, a commission has been created and has been instructed to proceed with the examination of Indians on their reservations, naming those particular Indians who possess the necessary qualifications to entitle them to the unrestricted use of their moneys and properties entirely free from governmental control. When this commission shall have reported, it is then proposed to separate those so qualified from governmental control through the issuance to them of patents in fee for all lands now held in trust for them by the Government, and to transfer to them all funds to which they are entitled, and finally sever the bonds which now hold them as Government wards, either upon application of the individual Indian or by departmental authority, as shall hereafter be decided upon.

FIVE CIVILIZED TRIBES.

By the Indian appropriation act approved August 1, 1914, effective September 1, 1914, the offices of the Commissioner to the Five Civilized Tribes and superintendent of Union Agency in Oklahoma were abolished, and in lieu thereof the President of the United States was authorized, by and with the advice and consent of the Senate, to appoint a Superintendent for the Five Civilized Tribes, with his office located in the State of Oklahoma, with authority to reorganize the department and to eliminate all unnecessary clerks. A supervisor was placed in charge of the superintendency on September 1, 1914, and the accounts and mailing divisions of the former offices were consolidated. A superintendent was appointed December 22, 1914, and entered upon duty January 1, 1915. His report shows that on

April 5, 1915, 14 divisions in the office were consolidated into 7, the field force was reorganized, and 59 employees were eliminated; this reorganization was effected to eliminate duplication of work, but the large reduction in employees was made not so much because their services were not needed as because a deficit of approximately $25,000 had to be averted. While the bulk of tribal land has been allotted and sold, still the work incident to the supervision of the affairs of approximately 33,000 restricted individual Indians has materially increased.

Enrollment and allotment.—In the Five Civilized Tribes there are 19,525,966 acres of land, of which 15,794,400 acres have been allotted, 139,202 reserved for various purposes, and 2,549,959 acres sold.

Under the act of August 1, 1914, 312 additional persons were enrolled, making a total of 101,521 persons enrolled as citizens of the Five Civilized Tribes, to all of whom complete allotments, or payment of money in lieu of allotments, have been made, except in a few cases; but there remains a large amount of unfinished work in connection therewith, such as the investigation of alleged fraudulent and duplicate enrollments, adjustment of allotments, and miscellaneous details that constantly arise.

Auction sale of unallotted lands.—Two sales of unallotted lands in the Choctaw and Chickasaw Nations were held during the year, one of the timberlands and one of the surface of the segregated coal and asphalt lands, at which sales there were sold 3,147 tracts, containing 360,995 acres, for $2,176,148.

The first auction sale of unallotted lands in the Five Civilized Tribes was held in November, 1910. Since that date there have been sold a total of 32,972 tracts, containing 2,549,959 acres, for $14,652,-341.32, over one-half of which, together with the interest thereon, has been collected, of which $5,931,984 is on deposit in National and State banks in Oklahoma, bearing interest at an average rate of 4½ per cent, the balance being on deposit in the United States Treasury. There remains unallotted $7,400,000.

There remain to be disposed of 1,042,405 acres, including 823,521 acres of timberland and 184,757 acres of the surface of the segregated coal and asphalt land, all of which is located in the Choctaw Nation excepting 5,860 acres which are scattered throughout the Chickasaw, Creek, and Cherokee Nations.

Town lots.—A total of 309 towns have been surveyed and platted, which towns contain an area of 64,772.16 acres. Patents to 301 town lots were issued during the year, and there was received during the same period from the sale of town lots $4,668.16, which, together with receipts from sales made previously, makes a total of $4,539,-911.73 received from this source. Two thousand four hundred and

forty-eight town lots remain unsold, all of which, excepting 168, are located in the segregated coal and asphalt area in the Choctaw and Chickasaw Nations.

Choctaw and Chickasaw Nations.—The total area of these two nations is 11,660,951 acres, of which 6,953,048 acres are located in the Choctaw Nation and 4,707,903 acres in the Chickasaw Nation. There have been allotted a total of 8,091,386 acres, leaving 3,569,565 acres unallotted, of which 98,474 acres have been reserved for various purposes and 2,431,361 acres have been sold for $14,053,760. There remain to be disposed of approximately 1,042,000 acres and the coal and asphalt underlying the segregated coal and asphalt land and other tribal property, including over 2,000 town lots and six boarding schools, the estimated value of which is $16,000,000; also the distribution of all the funds of these tribes to citizens entitled to participate therein.

Cherokee Nation.—The total area of the Cherokee Nation is 4,420,068 acres, of which 4,346,203 acres have been allotted to 40,193 citizens, 22,880 acres reserved for town-site and other purposes, and the remainder, consisting of 50,905 acres, have been sold, except 80 acres. The tribal affairs of this nation are completed, with the exception of the disposition of the 80 acres of land now in litigation, 226 acres included in what is known as "Big Lake," the delivery of approximately 750 deeds and the completion of the per capita and equalization payments.

Creek Nation.—The total area of the Creek Nation is 3,079,095 acres, of which 2,997,114 acres have been allotted to 18,712 persons, 16,016 acres reserved for town-site and other purposes, and 63,470 acres sold, leaving 2,495 acres unsold.

During the year two suits have been instituted in the United States district court to recover certain lands for the Creek Nation, estimated in value from $2,000,000 to $4,000,000, allotted to Barney Thlocco and Thomas Atkins, who, it is claimed, were not entitled to enrollment. There has been paid to equalize Creek allotments a total of $1,048,325. The tribal affairs of this nation have been disposed of, with the exception of the completion of equalization payments, delivery of about 500 deeds, the disposition of 2,495 acres of unallotted lands, 168 town lots, the capitol building and lot, and 5 boarding schools.

Seminole Nation.—The total area of the Seminole Nation is 365,852 acres, of which 359,697 acres have been allotted to 3,119 citizens, 1,932 acres reserved for town sites and other purposes, and the remainder sold.

The tribal affairs of the Seminole Nation are practically completed, except the delivery of about 500 deeds, the disposition of the

to lease large areas of these reservations to white stock raisers, the Indians profiting only through per capita payments made from the lease moneys. The Indian Bureau looks with disfavor on per capita payments and discourages it, except where such payments are mandatory by law, or where the payments would manifestly promote the Indians' industrial advancement. The placing of tribal herds on Indian reservations has materially lessened the area to be leased by white stock raisers. The loss to the Indians, however, is not in the exact proportion of the area to be leased, as it is found that the demand for pasturage lands increases in proportion as the area to be leased diminishes, and where permits were formerly granted for $1.50 per head the Indians are now receiving from $2 to $2.50 per head.

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Oil and gas operations.—There are at present in Oklahoma approximately 30,500 producing oil and gas wells, of which about 1,200 are gas wells.

The development upon producing departmental acreage as between different nations is, according to the best information obtainable, as follows:

Oil and gas operations, Five Civilized Tribes.

Nation.	Oil wells.	Gas wells.	Abandoned leases and dry holes.	Grand total.
Cherokee	4,062	152	480	4,694
Creek	1,290	71	220	1,581
Choctaw and Chickasaw	39	6	11	56
Total	5,391	229	711	6,331

The constantly increasing production of the Cushing field has been the most prominent feature in the oil industry in the State of Oklahoma. At one time this district was producing approximately 300,000 barrels of crude oil daily, and at all times during the past year its production has equaled the combined production of all the districts in the State. The field, however, probably has reached its highest point of development and, in consequence, is now showing a gradual decline in daily output.

Large quantities of oil have been stored in steel tanks, owing to the inability of producers to find a ready market for the production. On June 30, 1915, there were approximately 39,000,000 barrels of Cushing crude oil held in storage, which is the largest amount of high-grade oil that has accumulated in storage in the development of any one field in the United States.

The force of gaugers working under the direction of the department has supervised the running of oil from restricted leases to storage during the past year to the extent of about 14,000,000 barrels. Practically all oil run to storage from departmental leases has been disposed of and the royalty interest paid.

Conservation of both oil and gas has received considerable attention during the past year. There has been a marked improvement in the attitude of the operators more fully to prevent the enormous waste of these natural resources. The State has passed a very commendable law providing for the conservation of oil and gas, and placed its enforcement in the hands of the State corporation commission. The department and the State are working in close harmony to reduce this waste, particularly with reference to natural gas, and much good will undoubtedly result from the present plan of operation.

An incomplete tabulation shows that approximately 1,985,000 barrels of crude oil have been destroyed by fire in the State within the past 12 months.

The independent refining business has been very prosperous. A number of new plants have been put into operation during 1914 and 1915. The total daily estimate refining capacity of these plants is approximately 75,000 barrels of crude oil.

The manufacturing of gasoline from casing-head gas has also continued to expand. The total capacity of all plants now operating in the State is about 54,900 gallons of the raw product.

Pipe lines.—During the fiscal year 34 new pipe-line applications were filed and of this number 26 have been approved and 2 have been dismissed for want of jurisdiction. Three of the approved lines were from the Cushing field to the State line on the south and east. The interstate pipe lines have all made noticeable improvements in their systems, thereby increasing their facilities 24,000 barrels daily.

Probate matters.—It is estimated that there are between 50,000 and 60,000 living minor members of the Five Civilized Tribes who have received allotments of land. Owing to the oil development in Oklahoma, the present values of these allotments range from a few hundred dollars to over $1,000,000 each. No other State has been confronted with such an enormous volume of probate matters. The county courts, with few exceptions, have exhausted every effort to safeguard the interests of these minors. Nevertheless hundreds of these estates have been plundered by unscrupulous guardians. Originally the only assistance renderd the probate courts by the department was through the field clerks, but other duties incident to their work prevented them from giving probate matters sufficient attention. Realizing this condition, the appropriation act of June 30, 1913, provided for the employment of such attorneys as the Secretary of the Interior believed necessary in connection with probate matters affecting individual allottees of the Five Civilized Tribes.

The State authorities have shown a disposition to cooperate in every way possible with the department, and the Supreme Court of the State of Oklahoma has provided uniform rules of procedure in probate matters, at the suggestion of the Commissioner of Indian Affairs, after his conference with county judges, county attorneys, and tribal attorneys in January, 1914. Many entire estates and hundreds of thousands of dollars have been saved to these minors through the efforts of the probate attorneys during the fiscal year.

Health.—Health conditions among the restricted Indians in the Five Civilized Tribes demand serious consideration. Many are afflicted with tuberculosis and trachoma, in addition to other contagious and infectious diseases. There are practically no facilities for their treatment. However, there is in course of construction at

Talihina a sanitarium for Choctaws and Chickasaws. Unless the health of the individual is conserved, small permanent value can result from the efforts of the department to supervise the Indians' property. Diseases are spreading with alarming rapidity, due to the fact that many full-blood Indians do not believe in contagion and infection and take no precautionary measures when a member of the family is afflicted. Many applications for aid are received from Indians suffering with insidious and loathsome diseases, who have no money to obtain medical treatment, on the supposition that the Government has provision for their relief. Provision for sanatoria, treating stations, and physicians, conveniently located, should be made without delay.

Education.—The act of Congress approved August 1, 1914 (38 Stat., 597), provided $275,000 to be expended, in the discretion of the Secretary of the Interior, in the aid of common schools in the Osage Nation, the Quapaw Agency, and the Five Civilized Tribes. The necessity for this appropriation is apparent in view of the extensive acreage of allotted land which is not subject to taxation, as it assists in the maintenance of public schools in districts where, owing to the restricted Indian population, sufficient revenue can not be provided otherwise. Of this appropriation, not including administrative expense, $262,473.19 was paid to 2,219 school districts, at which 13,745 Indian children and 2,127 freedman children were enrolled. This fund was expended as nearly as possible in the various districts in proportion to the number of Indian children enrolled and the percentage of nontaxable land in the district. By this assistance it was possible to extend the school term to eight months in the majority of districts, and the apportionment was made in harmony and with the cooperation of the county and State officials.

Four tribal boarding schools were maintained in the Choctaw Nation, one in the Chickasaw, three in the Creek, and one in the Seminole, from tribal funds, and the Cherokee Orphan Training School, near Tahlequah, purchased by the United States as authorized by the Indian appropriation act of June 30, 1913, and conducted for the benefit of orphan children of the Five Civilized Tribes, the total enrollment in said schools being 1,204. In the eight contract schools in the Choctaw and Chickasaw Nations there were 358 Choctaws enrolled and 206 Chickasaws, making a total enrolment of 564. The number of Indians of the Five Civilized Tribes enrolled at Carlisle Indian School was 52; Chilocco Indian School, 249; Haskell Institute, 215; and Seneca Indian School, 46; or a total of 562 children in these schools. There were 5,790 Indian children in schools in incorporated towns and 13,745 in schools in the rural districts, making a total of 19,535 Indian children in the public schools. The total enrollment in the tribal boarding schools, the contract schools,

and Carlisle Indian School, Chilocco Indian School, Haskell Institute, and Seneca Indian School, together with the enrollment in public schools, was, therefore, 21,854. About 15 per cent of all Indian children enumerated in the various districts were not in school during the year.

Where payments of moneys are made to parents and guardians, the remittance is, wherever advisable, withheld until a satisfactory report of school attendance on the part of the children or wards has been received. This method has proven very effective in securing school attendance of children who otherwise would not be sent to school. Indian schools should be maintained for that class of Indian children who do not speak English or who live in remote localities not provided with adequate public schools, and until lands become generally taxable the present appropriation in aid of common schools should be continued.

Needed legislation.—While considerable tribal property remains undistributed, the administration of Indian affairs in eastern Oklahoma has become one largely of supervision and guidance of individual restricted Indians and their affairs. Dependable results must come through education and thrift. Many of these restricted Indians are primitive in their thoughts and actions, unfamiliar with the changed conditions which suddenly have surrounded them. They must have time and assistance to accommodate themselves to the new order of things involving intense commercial competitions, not to mention the many snares of the astute and practiced dealer. The communal system of ownership of property, to which these people were accustomed for many generations, did not have in it the elements of the present-day business practices. Not even in their languages are there indications of their familiarity with an individualized commercial system of values. Such words as "patent," "mortgage," "conveyance," "contract," etc., do not appear in their lexicons. Their mode of living and exchange of values did not contemplate the significance of the present transactions involving these considerations. It is therefore not strange that many convey, when permitted, their property for inadequate consideration and reduce themselves to destitution.

With large areas of communal land for the pasturage of horses, cattle, and hogs, an abundance of game and fish free to all, regular and fruitful seasons, and tribal provisions for schools, there was little need for intensive farming or incentive for economy and, less, training for the day when each must confine himself to a small acreage of land and by his own endeavors provide for his needs and contribute his share to the maintenance of the institutions of the government under which he might live. The time has come when the Indian must work with the tools and in the way others use

to survive. That kind of education, which not only trains the brain and the hand for cooperative action, but more especially instills in the individual the desire to work and the ambition to maintain himself, fit and strong, should be liberally provided and regular attendance in school required. Every effort, legislative and administrative, should be made to protect the restricted Indian's health, to retain his allotment or a reasonable part of it, to encourage him to live upon it, to farm it himself, and to use his funds for his permanent benefit.

Thirty to fifty years hence the personnel of the Indian population in Oklahoma will be those born since the rolls closed March 4, 1907. Manifestly particular attention should be given to their education and their inheritances. Their names do not appear on the tribal rolls, and they have no allotments of land.

Approximately one-third of the enrolled Indians of the Five Civilized Tribes are restricted. They have been thus classified according to their quantum of Indian blood. Many of these are able to care for themselves and do not need the supervision of the Government. Provision should be made for the personal determination of those who need supervision and assistance, and upon such determination those capable of attending to their own affairs should be so declared. The speedy settlement of tribal affairs and distribution of the tribal funds to those qualified by determination of competency and those by law unrestricted should be made, and the funds of those needing further supervision used for their permanent benefit.

To the end that tribal affairs may be terminated and that the department may be in position properly to supervise the individuals who need and should have governmental assistance, such persons to be determined by a personal investigation and enumeration, and thereupon declared restricted, the following legislation is suggested:

First. For the disposition of coal and asphalt minerals in the Choctaw and Chickasaw Nations, underlying about 440,000 acres.

Second. For early per capita disposition and distribution of tribal moneys.

Third. For a survey of the boundary line between the State of Texas and the Choctaw and Chickasaw Nations, Oklahoma, along the Red River, as a basis for settlement of the numerous disputes which have arisen and continue to arise by reason of the uncertainty as to the correct boundary.

Fourth. For a further appropriation of at least $275,000 to be used during the next fiscal year in the aid of common schools in Oklahoma, and for the continuation of such tribal or Government schools as may be necessary.

Fifth. To provide for sanatoria, treating stations, and physicians conveniently located for the treatment and prevention of diseases.

Sixth. For the repeal of the law which permits restricted Indians to lease their lands for agricultural purposes without departmental supervision.

Seventh. For the repeal of the law which provides that lands of restricted Indians shall immediately become unrestricted upon the death of the allottee, and, in lieu thereof, provision for the sale, under departmental supervision, of inherited restricted lands by restricted heirs.

Eighth. For the partition of estates of deceased allottees, obviating the dissipation of small interests of heirs on account of the expense of a guardian sale, and preventing undue control of the entire estate by a few of the heirs or their grantees.

Ninth. For the repeal of the law which permits a restricted Indian to make a valid will of his restricted property.

Tenth. For payment of equalization and per capita funds to heirs of deceased allottees upon proofs of heirship without the expense of administratorship.

PENSION OFFICE.

Number of pensioners.—There were on the pension roll at the end of the fiscal year 748,147 names, a net loss of 37,092 from the total of 785,239 on the roll at the beginning of the year.

The percentage of deaths of Civil War soldiers from 1909 to 1915 increased gradually from 5.2 per cent to 7.7, but the actual number of deaths does not always show an increase year by year.

The number of deaths of Civil War soldiers (pensioners) during the year was 33,255, as against 33,639 in the fiscal year 1914, this being the first year, however, which shows a decrease in the number of widows on the roll, there having been more deaths of widows and remarriages than additions to the roll during the year. The number of deaths of widows on the roll during the year was 17,915.

Unexpended balances of appropriation.—The unexpended balances of appropriations at the close of the year were as follows:

For Army and Navy pensions	$3,534,964.08
For fees and expenses, examining surgeons	104,295.60
For salaries	51,333.15
For per diem and expenses, special examiners	34,667.71
Total	3,725,260.54

Disbursements for pensions.—The amount disbursed in the payment of pensions during the year was $165,518,266.14, as against $172,417,546.26 for the preceding year and $174,171,660.80 for the

year before that. This shows a growing decrease in the annual expenditures, which may naturally be expected to continue.

The amount appropriated for the payment of pensions for the fiscal year 1915 was $169,000,000, and the appropriation for the current fiscal year is $164,000,000. It is estimated that $160,500,000 will be needed to be appropriated for the fiscal year 1917.

The total amount disbursed for pensions from July 1, 1790, to July 1, 1915, is shown to be $4,895,475,637.08, of which amount $4,614,643,267.43 is charged to allowances made on the basis of service rendered in the Civil War.

The number of pensioners residing in foreign countries in the year 1915 was 4,660, and the amount paid them was $945,220.19.

Certificates issued and applications filed.—There were 95,203 certificates issued during the year, as against 114,902 issued during the fiscal year 1914. There were received during the year 80,862 applications of all kinds. The total number of inclosures received through the mail division was 1,513,232, and the total number of pieces sent out was 3,997,868.

Reduction of force.—A further decrease in the work of the Pension Bureau, due to natural causes, necessitated a further reduction in the force of employees of the bureau. Congress therefore eliminated 93 positions for the current fiscal year. The vacancies occurring throughout the year by reason of deaths, resignations, and transfers were not filled, however, so that enough had occurred by the end of the fiscal year to meet the requirements of the law without having to drop any employees from the rolls. All the vacancies, however, were not of the grades required, hence it became necessary to reduce the salaries of quite a number of employees in order to meet the requirements of the new appropriation act. For the next fiscal year there are 1,182 employees as against 1,275 for the past year.

Family-data circular.—An improved circular was prepared with much care for the purpose of eliciting information as to the marital relations and service of pensioners that would be valuable in the adjudication of claims of both the soldiers and sailors and their widows and children and also valuable for historic purposes. This circular was sent to every male pensioner on the rolls (440,000) and 349,091 were filled out and returned to the bureau during the fiscal year.

Metal boxes for files.—There are over 2,000,000 files of pension claims in the bureau. They have been held together by a leather strap in bundles of about 50 each, and the life of such a strap has been about two years. Hence it was necessary to renew it every two years, while its cost has materially increased from time to time. Also, in handling the bundles thus strapped the files would be much

worn and abraded. Therefore galvanized steel file boxes are being substituted for the leather straps.

They are 27 inches long, 6 inches high, and 4½ inches wide and hold from 40 to 80 cases each. They protect the files of papers, allow them to be more readily handled, and at less cost for labor and greater economy of space. The boxes cost the bureau 37½ cents each, which is less than the cost of a strap. There are now installed 2,900 of such boxes and 3,100 more are ordered. Others will be ordered as the straps wear out. This is believed to be an improvement of much importance.

Clearance section.—A system of accounting for claims through clearance sections has been established in the several large divisions, and thoroughly tested, by which the exact status of the work of the bureau, day by day or on any given day, may be known, so that when the pending claims were actually counted at the end of the fiscal year and the result compared with the number shown to be on hand by the bookkeeping system the discrepancy was very slight—only 5 in approximately 45,000 claims. This result was really marvelous in view of the fact that the pending claims are handled very many times in going into and out from the divisions through the clearance sections before final adjudication and allowance.

Formerly the counts of claims were largely haphazard, and there existed no ready means of testing their reliability. Hence the discrepancies were large, frequently many thousands. Now the results are sure, as shown by the harmony between the actual count and the bookkeeping.

APPEALS IN PENSION AND BOUNTY LAND CLAIMS.

On page 43 in the table shown in the report of the office of the solicitor statistics concerning the work of the pension-appeal section of that office during the fiscal year ended June 30, 1915, are given in detail. It appears therefrom that there were pending on July 1, 1914, 3,111 undecided appeals. During the past year there have been docketed 3,202 appeals and motions, making in all 6,313 cases presented for consideration and decision. Of these 5,450 were disposed of, leaving 863 pending.

Compared with the work of the year covered by the last annual report, the figures show a material reduction in the number of appeals filed. It is gratifying, however, to note the very substantial increase in the total number disposed of, thus greatly reducing the number of pending matters, as a result of which these cases are now assigned out for consideration within a reasonable time after receipt and disposed of with such dispatch as careful consideration of the work will warrant.

PATENT OFFICE.

During the fiscal year ended June 30, 1915, there were filed 66,497 applications for patents for inventions, 2,679 applications for design patents, 173 applications for reissues, 8,376 applications for registration of trade-marks, 947 applications for labels, and 444 applications for prints, the total number of such applications being 79,116. In addition, 1,938 appeals and 26 disclaimers were filed. During the year there were granted 44,402 patents (including 1,489 designs and 179 reissues), 6,919 registrations for trade-marks, 762 registrations for labels, and 321 registrations for prints. The number of patents which expired during the year was 20,992. The number of allowed applications which were forfeited for nonpayment of final fees therein was 11,882.

The total receipts of the office were $2,270,937.68, and the total expenditures for all purposes were $2,087,581.26, the net surplus of earnings over expenditures being $183,356.42 for the year, with a grand net surplus of $7,714,316.62 since the establishment of the present system in 1836.

BUREAU OF EDUCATION.

Higher education.—The Bureau of Education through its representatives visited 64 colleges and universities, 37 of which were carefully inspected. One was inspected at the request of the President of the United States, 28 at the request of the State superintendent of public instruction of North Carolina, and 7 at the request of the State superintendent of public instruction of Oregon. A preliminary survey was made of the higher institutions in the State of Washington. Decisions regarding the eligibility of 402 universities, colleges, and schools for inclusion in the list of institutions to be accredited by the United States Military Academy were rendered at the request of the War Department. The reports of the expenditures of Federal funds by the land-grant colleges were examined, and a study has been begun of the present condition of the principal and income derived from the land grants of the Morrill Act of 1862. The specialist in higher education represented the bureau at 15 conferences and association meetings. This division prepared two bulletins on accredited secondary schools of the United States and on opportunities for foreign students at colleges and universities in the United States.

School administration.—The division of school administration has completed a bulletin on the administration of schools in cities having a population of not less than 25,000 nor more than 30,000; prepared a chapter on current progress in education in cities of less than 25,000 population; began an annotated bibliography of the

more important topics in city school reports; issued 15 city school circulars; completed a digest of the general school laws of all the States; completed a historical study of the development of public education in the State of Alabama and began a similar study of education in Tennessee; made a study of the methods of teaching reading in 1,000 schools in the United States, England, France, and Germany; conducted an experiment in teaching reading by the phonic method in the primary schools of Washington, D. C., and demonstrated this method in the University of Virginia.

School buildings and sanitation.—The special agent located at Nashville, Tenn., has furnished specific advice to school authorities in regard to the architecture of school buildings, particularly in rural communities. He has continued the loaning of models of rural schoolhouses to assist in the development of a taste for a better type of rural-school architecture. Counties in several States have taken these models as standards and are working out better school buildings for their districts. Assistance has been rendered with the rural-school surveys in several counties in Tennessee. A bulletin has been prepared on open-air schools and another on school baths is now in course of preparation.

Industrial education and education for home making.—A division of industrial education and education for home making was created during the year by the appointment of a specialist in industrial education and two specialists in home economics. Assistance was rendered in an industrial survey of the city of Richmond, Va., and the inauguration of a system of industrial education; studies of vocational education were made in 53 cities in 16 States by the specialist in industrial education; he visited and participated in 23 conferences on industrial education; he has prepared a course of study in the manual arts and numerous reports on various phases of vocational education.

One of the specialists in home economics has been assigned to the task of cooperating with departments of home economics in colleges of agriculture and mechanic arts and the other will cooperate with normal schools for training teachers. Their specific work is the improvement and extension of education for home making in all classes of educational institutions. An interesting experiment was carried on in four schools of home making in the State of Delaware. These schools, each of which was in session three days in the week for five weeks, were attended by the married women and older girls of the communities in which they were held. They were planned and directed by one of the specialists in home economics in cooperation with Delaware College, in the hope of finding some practical means by which instruction in regard to the important work of home making in rural communities may be brought to the millions of

countrywomen. It is expected that this plan will be tried in a larger number of communities this year.

Rural education.—The work of the four specialists in rural education was differentiated by assigning to each one a particular phase of rural education. From one-fourth to one-half of the time of the specialists is spent in the field visiting rural schools, advising school officers, State education officers, and State legislatures, and attending educational meetings. In this work they have visited nearly all of the States of the Union and have participated in nearly 100 conferences. There have been prepared 15 sets of lantern slides on five different phases of rural education, which are loaned to school officers for short periods. Bulletins have been prepared by the specialists in rural education on consolidation of rural schools, county unit organization for the administration of rural schools, organization of State departments of education, free textbooks and State uniformity, efficiency in preparation of rural-school teachers, rural-school system of Minnesota, school system of Ontario with special reference to rural schools, and the status of rural-teacher preparation in county training and high schools.

School and home gardening.—Within the year the division of school and home gardening was established with two specialists and an assistant. In the maintenance of this division the bureau had the cooperation of the International Child Welfare League. The purpose of the division is to promote home gardening by children of school age in cities, towns, suburban communities, and mill villages, both for its educational value and for the contribution which may thus be made for the support of the families of which the children are a part. The plan involves:

1. The utilization of home back yards, vacant lots, and other available plats of land for children's gardens to be cultivated under school supervision.
2. The employment for the entire year of a teacher trained and skilled in gardening for each elementary city school.
3. The gardening work should be done after school hours, on Saturdays, and during vacation. During school hours garden teachers should give class instruction in elementary science, nature study, and, if required, other regular school subjects.
4. Children should be urged to make their gardens as large as they can cultivate thoroughly.
5. The products of the garden should be used, first, to supply the homes of the children, and only the surplus should be sold or canned.

Visits have been made to many cities, towns, and mill villages in Arkansas, Missouri, and most of the States east of the Mississippi River with a view to interesting school officers and civic associations in this subject. Reports show that more than 100 superintendents have adopted the plan and that 35 have already put it into operation in one or more schools. Owing to the lack of trained teachers for

this work, the three members of this division were detailed to teach in the summer schools of Cornell University, Teachers College of Columbia University, and George Peabody College for Teachers, which institutions provided courses for the training of garden teachers.

Negro education.—The work of this division has included two distinct lines of activity: First, a comprehensive survey of all private and higher schools for negroes; second, constructive efforts to improve the work of these schools. The field work which entailed from one to four visits to 575 institutions was completed in June, 1915. Systems of accounting have been proposed for several schools and schools have been urged to inaugurate regular dormitory inspection.

Civic education.—The specialist in civic education has cooperated with representatives of various civic and educational organizations in the States of Maryland and North Carolina in the planning and organization of systematic civic instruction. In Wilmington, Del., the specialist in civic education is assisting in organizing a course in civic education for the elementary schools and in reorganizing the high-school course on the same subject. He prepared a bulletin on civic education in the elementary schools as illustrated in Indianapolis and has cooperated in the preparation of a manual on the teaching of community civics which has been published as a bulletin of the bureau.

Education of immigrants.—The division of education of immigrants was established for the purpose of studying problems connected with the education of immigrants and their preparation for American life and citizenship, and to assist in making more adequate provisions for giving to immigrants such instruction and help as will enable them to appreciate American ideals, adjust themselves to American industrial conditions, understand American social and governmental institutions, and participate intelligently in the democratic life of the country. Investigations have been made in various sections of the country to ascertain facilities now existing for the instruction of adult immigrants and to give information and advice to school officers and educational organizations for the improvement of opportunities for the education of immigrants. In cooperation with the Bureau of Immigration a plan has been devised whereby the names, prospective addresses, and nationalities of immigrant children and the relationship of the persons to whom they are sent are forwarded regularly to the superintendents of schools in the cities or counties to which immigrant children are destined. Two circulars on civic education of immigrants have been issued.

Kindergarten education.—The kindergarten division has given much attention to kindergarten legislation; it has corresponded with

the superintendents of public instruction and others interested in education in 39 States whose legislatures were in session within this fiscal year. In several of these States bills were introduced providing for the establishment of kindergartens upon the petition of parents. A law embodying this feature was enacted by the Legislature of Nevada, and North Carolina enacted the first kindergarten law of that State. Largely as the result of the activity of one of the special collaborators of this division, 50 new kindergartens have been established in California within the year. Manuscripts for bulletins have been completed on the following subjects: Comparison of the Montessori method and the kindergarten; opinions as to the value of the kindergarten in children's homes, orphanages, and similar institutions; adjustment between the kindergarten and the elementary schools; survey of kindergarten training schools. Reading courses for kindergarten teachers, kindergarten supervisors, and mothers are in course of preparation.

Home education.—This division distributed more than 12,000 pamphlets on the care and early education of children and kindred subjects and 26,568 copies of home reading courses, and has prepared a selected list of 1,000 books for children's reading.

Library.—The library received during the year 1,740 volumes, 8,000 numbers of serial publications, and 8,081 numbers of periodicals. It compiled 200 bibliographies on special topics and 10 numbers of the monthly record of current educational publications. Loans from the library to institutions and individuals outside of the office amounted to 2,741 volumes.

Statistics.—The statistical division collected and compiled statistics of city school systems from all the States and from approximately 21,000 educational institutions.

Editorial division.—The editorial division supervised the printing of the two volumes of the Annual Report for 1914 and 48 bulletins. There were issued also 168 miscellaneous publications, most of which were in multigraph form.

Alaska school service.—For this year the field force of the Alaska school service consisted of 5 superintendents, 1 assistant superintendent, 97 teachers, 7 physicians, and 8 nurses. Sixty-seven schools were maintained with an enrollment of about 3,500. Three hospitals were maintained and natives were cared for under contract by five others. To improve methods of preserving fish and berries for winter use, steam home canning outfits for use in preserving fish and meats as well as berries and vegetables were sent to three of the largest villages during the summer of 1914. The income of the village of Atka has increased 150 per cent because of the establishment of a cooperative store owned by the natives and maintained by them under the supervision of the teachers of the United States public school. The cooperative stores at Hydaburg, Klawock, Kluk-

wan, and on St. Lawrence Island have also been successful. Additional reservations for natives were made by Executive order on the Kobuk River in Arctic Alaska and on Cook Inlet. A code of regulations for the government of the colony on Annette Island was put into effect January 28, 1915. Under these regulations the government of the Annette Island Reservation is vested in an elective council of 12 members with power to pass such ordinances for the local government of the reservation as are not in conflict with the Government of the United States, the laws of the Territory of Alaska, or the regulations prescribed by the Secretary of the Interior.

Alaska reindeer service.—On June 30, 1914, there were in Alaska 57,872 reindeer distributed among 65 herds. The increase for the year was 22 per cent, notwithstanding the fact that nearly 6,000 reindeer were killed for their meat and hides.

Commissioner.—The commissioner has continued his policy of attending meetings of more important national, sectional, State, and local associations interested directly or indirectly in education, and in visiting and inspecting schools of all kinds and grades. In doing this he has traveled approximately 70,000 miles, visited 27 States, and made more than 200 addresses. Within the year he has called nine special conferences, six of which he attended and directed.

Recommendations.—The following recommendations are submitted by the commissioner: An increase in the salaries of the chief clerk, editor, and statistician; the removal of the limit on the amount of salaries which may be paid from the lump-sum appropriation for rural and industrial education; provision for an assistant commissioner of education and an assistant editor; more adequate provision for the investigation and promotion of rural education, industrial education, and school hygiene, and school and home gardening; provision for the study and promotion of concrete education in city schools, investigation and promotion of education of exceptional children, investigation and promotion of secondary education, investigation and promotion of commercial education, and investigation and promotion of education in civics and citizenship. An increase in the appropriation for traveling expenses should be provided for the commissioner and his assistants to enable them to give more direct and more efficient help to school officers and teachers in all parts of the country. There should be an increase in the appropriation for the education of natives of Alaska and for medical relief of natives of Alaska.

GEOLOGICAL SURVEY.

Scope of the Survey's work.—The scientific work of the Geological Survey was continued along lines similar to those followed in previous years, and the usual number of contributions have been made

to the knowledge of geology and related subjects. The appropriations for the work of the Survey for the fiscal year 1915 aggregated $1,620,520. The great demand for mineral investigations in various parts of the country was, in part, relieved by an increased appropriation of $100,000 for geologic surveys. This permitted largely increased activity in work on the public lands and to an appreciable extent met the demand for the investigation of oil and other mineral resources in the States containing no public lands. The appropriation for water-resources work, however, remained inadequate, being, in fact, $50,000 less than it was eight years ago, whereas a large portion of the land-classification work depends on this appropriation. The roll of Survey members holding Secretary's appointments numbered at the close of the year 909, an increase of 18.

Geologic surveys.—Investigations were continued in 47 States by a force of 164 geologists, and 70.3 per cent of the appropriation was spent in the public-land States. Detailed geologic surveys covered 20,292 square miles and reconnaissance geologic surveys 47,355 square miles, a total of 67,647 square miles. Systematic detailed surveys of mining districts were carried on in Arizona, Colorado, Minnesota, Nevada, New Mexico, Oklahoma, Oregon, and Utah; reconnaissance studies of mining districts were made in Arizona, California, Colorado, Idaho, Kentucky, Montana, Nevada, New Mexico, North Carolina, Oregon, Tennessee, Utah, and Wyoming; and general and detailed geologic and paleontologic work was continued in all parts of the country. A large amount of the geologic work was done in the coal and oil fields, especially in the public-land States, and the search for commercial deposits of potash and nitrates was continued. Cooperative work was carried on with the geological surveys of 17 States, as well as with the Bureau of Mines, Bureau of Standards, Office of Public Roads, Bureau of Fisheries, Forest Service, Smithsonian Institution, Lighthouse Service, War Department, Navy Department, Carnegie Geophysical Laboratory, and marine biologic station at Dry Tortugas.

Surveys in Alaska.—The early date of the appropriation for the continuance of the investigation of the mineral resources of Alaska—April 6, 1914—made possible an early start for the field, which was in striking contrast to the two previous years, when the delay in granting funds until summer hampered the field work and increased its cost. Ten parties were engaged in surveys and investigations, the work resulting in 1,000 square miles of exploratory geologic surveys, 7,700 square miles of reconnaissance geologic surveys, 325 square miles of detailed geologic surveys, 600 square miles of exploratory topographic surveys, 10,300 square miles of reconnaissance topographic surveys, and 10 square miles of detailed topo-

graphic surveys. Considerable work was done by the geologists in investigating special field problems in the important mining districts.

Statistics of mineral products.—Work was continued on the annual report on the mineral resources of the United States for the calendar years 1913 and 1914. In the collection of mineral statistics the Survey cooperated with the State geologists of 16 States and conducted correspondence with 90,000 producers. The practice in making the Mineral Resources report a treatise on the sources of mineral production of the United States was continued. The report is still, however, an annual inventory of the Nation's mineral resources. The separate reports on each principal mineral product are, as soon as the figures become available, printed as advance chapters of the volume and widely distributed. On June 30, 1915, 20 chapters of the volume for 1914 had been published or were in press. About January 1 preliminary estimates of the production of the principal minerals in 1914 were given to the newspapers. The widespread demand created by the European war for information concerning American mineral products was met by the immediate preparation of statements for the press and the prompt issue in September of Bulletin 599, "Our mineral reserves." This resulted in a heavy and sustained correspondence between the producer and the consumer, the Survey acting as a clearing house of information on all mineral resources.

Topographic surveys.—New areas amounting to 20,508 square miles were topographically mapped, making the total area surveyed to date in the United States 1,218,290 square miles, or 40.2 per cent of the entire country. Areas aggregating 3,048 square miles were resurveyed, making a total for the year of 23,556 square miles. In addition 19 square miles was surveyed in Hawaii and 10,910 square miles in Alaska. This work was carried on in 30 States, Alaska, and Hawaii, and 20 of these States and Hawaii cooperated with the Federal Survey. The technical field force numbered 151, and in addition 37 technical field assistants were employed during the field season. The average cost per square mile was $22. About 60 per cent of the appropriation was expended in the public-land States.

Water resources.—The present appropriation of $150,000 is insufficient to meet the pressing demands upon the Survey for the investigations of stream flow and underground waters. During the year 1,350 gaging stations for measuring the discharge of streams were maintained in 41 States and in Hawaii. The technical force numbered 76. Twenty-five States and Hawaii cooperated in this work, and the Reclamation Service, Indian Office, Army Engineers, and Public Health Service also cooperated largely in the study of the flow of particular rivers. Investigations of underground waters have been conducted in 12 States. Investigations of the present and probable

future use of both surface and underground waters have been made in connection with the classifications of public lands, with special reference to their use for power under Government permit or for agriculture under the enlarged-homestead, desert-land, or Carey acts. About 64 per cent of the appropriation was spent in the public-land States, largely in stream gaging.

Land classification.—No coal lands were withdrawn during the year, but 2,363,646 acres were restored, of which 292,695 acres were appraised and made available for purchase as coal lands, leaving outstanding withdrawn at the end of the year 48,244,274 acres. There was a decrease of 113,088 acres in the area of coal land to which values had been given, owing to a reclassification as noncoal land of certain areas heretofore classified as coal land and appraised. At the end of the year a total of 19,489,771 acres had been valued, at an average price of $40.60 an acre.

During the year 197,073 acres of oil land were withdrawn and 180,818 acres of nonoil land were eliminated from withdrawals, leaving the net area included in oil withdrawals 4,774,418 acres.

The phosphate classifications resulted in the withdrawal of 273,221 acres and the restoration as nonphosphate land of 454,894 acres, leaving the area withdrawn 2,660,376 acres.

During the year 119,224 acres were withdrawn for potash explorations and 2,880 acres were eliminated from existing withdrawals, leaving the withdrawn area 342,013 acres. Areas containing metalliferous minerals amounting to 967,210 acres, chiefly in Indian reservations, were classified. Of this total 929,916 acres were classified as nonmineral and 37,294 acres as mineral land. The new withdrawals of land valuable for power sites amounted to 292,134 acres and the restorations to 55,646 acres, leaving the area withdrawn 2,228,105 acres. The areas withdrawn for public-water reserves during the year amounted to 19,257 acres and the restorations to 366 acres; the total area withdrawn is 182,653 acres.

During the year 17,485,259 acres in 14 States were classified as nonirrigable and were so designated under the enlarged-homestead acts. The total area thus designated to date amounts to 235,596,180 acres. During the year there was a total classification of about 23,000,000 acres. The total areas withdrawn during the year for all purposes were over 900,000 acres and the total restorations were over 3,000,000 acres.

Publications.—The number of books distributed during the year was 596,649, and the number of topographic maps and geologic folios 510,637, a total of 1,107,286. Of these 342,404 maps were sold. The amount of money received and turned into the Treasury from the sale of publications was $27,711.12. During the year 187 reports were published and 16 were reprinted, 3 geologic folios were published and 3 reprinted, 90 new topographic atlas sheets were engraved and printed and 98 were reprinted, and 46 other maps were

issued, a total of 443 publications, including reprints, with total editions aggregating 1,424,969. A large amount of additional work was done by the engraving division under contract for other departments through the Government Printing Office.

RECLAMATION SERVICE.

The Government's reclamation projects in the aggregate now exceed in cultivated area and annual crop returns some of the smaller States. In 1914 the projects irrigated 761,271 acres, of which 703,424 acres yielded crops valued at $16,475,517, or an average of $23.50 per acre. At the same time the Reclamation Service was prepared to supply 1,240,875 acres; that is, the works were completed and water ready for nearly 500,000 acres that were not in use. This area consists of private and State holdings, unentered public lands, and unirrigated portions of the producing farms.

It is important to bring these idle lands into use to play their part in the social and commercial upbuilding of the projects. Undeveloped they delay the repayments to the reclamation fund and in some cases constitute a positive menace to adjoining farms by harboring animal and weed pests.

Irrigation and crop results on Government reclamation projects 1914.[1]

Project.	Irrigable acreage.[2]	Irrigated acreage.	Cropped acreage.	Value of crops.	
				Total.	Per acre cropped.
Salt River	187,112	173,030	169,719	$4,039,079	$23.80
Yuma	60,000	25,207	22,568	709,409	31.43
Orland	14,300	7,354	6,540	176,381	26.99
Uncompahgre Valley	52,338	33,873	33,091	870,381	26.30
Boise	207,000				
Farms reported		64,767	58,064	1,033,447	17.80
Farms not reported [3]		18,823	16,868	300,140	17.80
Minidoka	117,090				
Gravity unit		45,730	39,138	661,796	16.91
S. S. pumping unit		35,788	33,512	558,059	16.65
Huntley	28,808	17,068	17,068	454,583	26.63
Milk River	13,440	2,201	2,163	34,618	16.00
Sun River	16,346	6,613	6,561	106,594	16.25
Lower Yellowstone	36,250	5,743	5,621	96,707	17.20
North Platte	91,504	60,532	59,536	890,202	14.95
Truckee-Carson	52,039	39,516	39,285	441,018	[4] 11.23
Carlsbad	20,261	12,690	10,731	237,663	22.15
Hondo	1,224	1,224	1,172	21,458	18.31
Rio Grande	40,000	28,442	27,302	1,160,720	42.51
N. D. pumping	12,239	1,056	1,045	36,440	34.87
Umatilla	17,000	5,102	3,013	88,614	29.41
Klamath	38,000	24,440	24,440	347,344	14.22
Belle Fourche	68,852	37,454	36,709	461,188	13.56
Okanogan	10,099	7,740	3,180	104,575	32.88
Yakima:					
Sunnyside unit	81,807	64,052	49,273	2,858,845	58.02
Tieton unit	34,000	20,600	15,920	472,480	29.60
Shoshone	41,166	22,226	20,905	313,826	15.01
Total	1,240,875	761,271	703,424	16,475,517	23.50

[1] Data are for calendar year (irrigation season), except on Salt River project, Arizona, data are for corresponding agricultural year, October, 1913, to September, 1914.
[2] Area Reclamation Service was prepared to supply water.
[3] Figures for farms not reported, except irrigated acreage, estimated from figures for reported farms.
[4] $18.22 excluding 19,000 acres native pasture land at $1.21 per acre and 4,908 acres otherwise not in full production.

To the settler it is particularly important to develop his entire farm. His water charges are based on the total irrigable area, not only the part actually watered. His chances of making these payments and meeting the overhead expense of his farm operations out of his receipts for crops and live stock are materially improved when he has brought his whole farm into production. In 1914 the water users irrigated 760,000 acres, but the irrigable areas of their farms totaled very close to 1,000,000 acres. Thus the total crop value, while enormous in the sum and averaging $23.50 per acre cropped, drops to $16.50 per acre irrigable; that is, for each acre of these farms liable to charges.

The measures adopted to encourage the development of idle project lands include the policy of pushing the projects to completion and formal opening as rapidly as funds permit, the assessment of a minimum operation charge per acre whether the land is irrigated or not, provision for enforced subdivision of large private holdings, and easier terms of payment so as to permit the settlers to employ their resources in building up their farms.

An important change in the reclamation law was made early in the past fiscal year by the enactment of what is commonly called the reclamation extension act. This law is designed to mitigate the adverse conditions affecting many of the settlers on the Government projects.

The original reclamation act required the settlers to repay the cost of construction in 10 years. When that act was drawn it was thought it would render the payments small enough so that the water users might meet them from their farm revenues. Experience proved this to be overoptimistic. The law provided no control over the settlement of the project lands. Any citizen with a homestead right could enter a farm. Many came to the projects without sufficient funds to weather the unproductive period in developing irrigated land. In some cases the settlers came long before the works were completed, and exhausted their resources in living expenses before water was ready. Still others paid high prices for private lands under the projects, burdening themselves with heavy interest charges on deferred payments. The conditions were aggravated by an increased cost of construction in most cases over the estimated figures, due mainly to the general rise in the cost of labor and materials during the time when most of the construction work was done.

The reclamation extension act aims to alleviate conditions by making the farmers' repayments much smaller each year, extending them over 20 years instead of 10, and graduating them so as to make the charges during the first few years less than the average. It is too early to determine the full effect of this important change in the

law, but it has given immediate relief to many of the settlers and renewed hope of permanent success.

The policy has been continued of making every possible effort to maintain cordial relations and a cooperative spirit between the irrigators and the department. The water users, individually or through their associations, have been freely consulted with regard to plans before proceeding with new work.

An important step in the same direction has been the appointment of boards, chosen equally by the water users and the department, to review the cost of all past work with a view to making any proper readjustments in charging these costs to the various projects. A central board reviews the reports of the various projects. These reports are now being filed, so that it is impossible to determine the results as yet. It is clear, however, that at least some minor adjustments will be found proper, and it is believed this extensive inquiry will meet the statements frequently made in the past of illegal and gross overcharges.

The construction work of the service has been carried on vigorously during the year, and a number of the largest projects brought nearly to completion. The field of usefulness has been broadened by work done in cooperation with numerous States, districts, and other organizations, thus extending the capacity of the available funds.

To promote economy and efficiency in the field work, a central office has been established at Denver, Colo., in charge of the chief of construction, and much of the executive and fiscal work formerly scattered over the various projects has been concentrated there.

The following table gives in concise form many of the items which have been accomplished to June 30, 1915.

Summary of construction results, Reclamation Service.

	To June 30, 1915.	To June 30, 1914.	Increase.
Reservoir capacity available.....acre feet..	6,500,360	5,460,510	1,039,850
Canals, ditches, and drains:			
Canals over 800 second-feet capacity.....miles..	359	325	34
Canals 301 to 800 second-feet capacity.....do....	610	538	72
Canals 50 to 300 second-feet capacity.....do....	1,420	1,318	102
Canals less than 50 second-feet capacity.....do....	6,371	5,826	545
Total canals.....do....	8,760	8,007	753
Ditches and open drains.....do....	832	548	284
Grand total, canals, ditches, and drains.....do....	9,592	8,555	1,037

	To June 30, 1915.		To June 30, 1914.		Increase.	
	Number.	Length.	Number.	Length.	Number.	Length.
Tunnels.....	89	*Feet.* 133,300	86	*Feet.* 129,341	3	*Feet.* 3,959

Summary of construction results, Reclamation Service—Continued.

	To June 30, 1915.	To June 30, 1914.	Increase.
Dams, storage and diversion:			
Masonry	*Cu. yds.* 1,992,502	*Cu. yds.* 1,346,904	*Cu. yds.* 645,598
Earth	9,231,109	8,817,236	413,873
Rock fill and crib	978,474	704,784	273,690
Total	12,202,085	10,868,924	1,333,161

	To June 30, 1915.		To June 30, 1914.		Increase.	
	Length.	Volume.	Length.	Volume.	Length.	Volume.
	Miles.	*Cu. yds.*	*Miles.*	*Cu. yds.*	*Miles.*	*Cu. yds.*
Dikes and levees	90.6	4,076,766	85.4	3,790,950	5.2	285,816

	To June 30, 1915.		To June 30, 1914.		Increase.	
	Concrete.	Wood.	Concrete.	Wood.	Concrete.	Wood.
Canal structures:						
Costing over $2,000	730	107	645	75	85	32
$500 to $2,000	1,482	323	1,264	206	218	117
$100 to $500	6,696	4,129	5,978	3,748	718	381
Less than $100	7,226	44,154	5,622	37,087	1,604	7,067
Total	16,134	48,713	13,509	41,116	2,625	7,597

	To June 30, 1915.		To June 30, 1914.		Increase.	
	Number.	Length.	Number.	Length.	Number.	Length.
Bridges:		*Feet.*		*Feet.*		*Feet.*
Steel	85	5,433	84	5,337	1	96
Combination	240	7,311	195	6,094	45	1,217
Wood	4,013	85,922	3,386	70,603	627	15,319
Concrete	284	3,740	210	3,191	74	549
Total	4,622	102,406	3,875	85,225	747	17,181
Culverts:						
Concrete	1,273	61,112	1,120	51,105	153	10,007
Metal	1,146	40,119	880	26,338	266	13,781
Terra cotta	567	29,052	306	16,191	261	12,861
Wood	2,728	62,663	2,329	54,628	399	8,035
Total	5,714	192,946	4,635	148,262	1,079	44,684
Pipe:						
Concrete		486,635		454,584		32,051
Metal		193,541		153,638		39,903
Terra cotta (tile)		634,108		451,928		182,180
Wood		260,676		192,036		68,640
Total		1,574,960		1,252,186		322,774
Flumes:						
Concrete	33	4,189	29	3,123	4	1,066
Metal	407	112,533	297	90,126	110	22,407
Wood	1,461	335,324	1,264	328,375	197	6,949
Total	1,901	452,046	1,590	421,624	311	30,422
Canals lined:		*Miles.*		*Miles.*		*Miles.*
Concrete		140.5		86.4		54.1
Wood ....do....		3.0		1.7		1.3
Buildings:						
Offices	75		74		1	
Residences	520		483		37	
Power plants	19		13		6	
Pumping stations	64		63		1	
Barns, storehouses, etc	390		385		5	
Total	1,068		1,018		50	
Wells, number and depth	367	29,337	361	28,717	6	620

Summary of construction results, Reclamation Service—Continued. 85

	To June 30, 1915.	To June 30, 1914.	Increase.
Constructions:			
Built	miles		
Railroads	do	784	
Siphons lines	do	82	
Power	number	2,554	
Transmission lines	miles	1,069	
		429	
Undeveloped:			
Water	horsepower		
Dam	do	36,776	
Total	do	4,250	
Excavation:		34,626	
Earth	cubic yards		
Solid or loosened material	do	115,999,284	
Total	do	7,586,948	
	do	6,964,126	
Dam	do		
Total	cubic yards	130,148,358	
Lining	square yards		
Total	cubic yards		
Removal by Reclamation Service	barrels		
Removal by Reclamation Service	do		
Removal by Reclamation Service	lb		

	To June 30, 1914.	Increase.
	733	51
	78	4
	2,376	178
	1,069	66
	402	27
	36,128	
	4,250	1,166
	34,878	1,156
	100,652,926	15,146,358
	6,998,148	937,740
	2,467,306	496,546
	110,118,379	16,580,644

BUREAU OF MINES.

Mining and mines of the Bureau of Mines.—Under the terms of its organic act, as amended February 25, 1913, the Bureau of Mines is charged with conducting inquiries and investigations relating to the production of minerals and the methods of mining them, to the increase of safety and health among those engaged in the mineral industries, and to the prevention of waste and improvement of efficiency in the development and utilization of the mineral resources of the public lands.

These studies and investigations are obviously fundamental and of the highest importance. In the conduct of the Bureau's efforts are directed solely toward the public welfare, to advance the welfare of all those who labor in the mines, and to benefit those industries and the public.

Organization of the Bureau of Mines.—In the [illegible] from July 1, 1910, to June 30, 1915, [illegible] chief attention, under the terms [illegible] to investigating the causes and [illegible] and to safeguarding the lives of [illegible] mineral fuels belonging [illegible] United States have been [illegible] ing efficiency in their [illegible] undertaken looking to [illegible] the metal-mining, [illegible] dustries. General examin[illegible] mines have been made with [illegible]

[illegible] had its beginning [illegible] from Siberia, [illegible] placed many [illegible] want which [illegible] It has taught [illegible] abilities in life. [illegible] ry. There are [illegible] Yukon and [illegible] can be saved [illegible] among them

unnoticed, and the bureau has demonstrated that this loss may be minimized and the yield of oil fields greatly increased by practicable methods of drilling and casing, especially by the use of mud fluid in drilling. Other investigations have developed practicable methods of controlling wells of high gas pressure and have indicated the precautions to be taken to prevent fires at wells and storage tanks.

Increased efficiency in the utilization of petroleum is assured by the Rittman processes devised by a chemical engineer of the bureau. One of these processes will enable refiners to increase the output of gasoline from crude petroleum 200 per cent or more, as compared with old methods, and thus assure lower prices for gasoline as compared with prices for crude oil, and prevent monopolization of the production of gasoline, the patent rights being dedicated to the public. Another process for the manufacture of benzol and toluol, used in the manufacture of synthetic dyes and high explosives, is now in successful operation on a commercial scale. The patent right and all patentable processes and ideas developed in connection with experimental work on it have been dedicated to the public. Heretofore benzol and toluol have been obtained chiefly from gas works or by-product coke ovens, and the invention opens up an entirely new source of supply and is of immense prospective importance to the chemical industries of the country.

Benefits from metallurgical investigations.—Metallurgical work by the bureau has been confined almost entirely to the smelter-smoke problem. The bureau has cooperated with the Selby and Anaconda smelter commissions, and the report of the Selby Smelter Commission is about to be published as a bulletin of the bureau. The work of this commission has attracted much attention, and its methods of procedure are being followed in other investigations of complaints of damage from smelter smoke in different parts of the country. A process devised by Dr. Cottrell, chief chemist of the bureau, has proved successful in precipitating injurious fumes in smelter smoke, and investigations in progress are showing how damage to vegetation from smelter smoke may be greatly lessened. The bureau is giving especial attention to the study of processes for removing sulphur from smelter gases.

Investigations of methods of treating low-grade and complex nonferrous ores are showing what methods are needed or what changes in old methods should be made in order to treat millions of tons of low-grade ore in the Western States that now lie unworked because profitable processes for saving the contained metals have not been perfected.

A study of accident prevention at blast furnaces and steel plants has already shown what are the common hazards to which workmen

at such plants are exposed and how accidents may be greatly lessened. Statistics of accidents, by causes, at stamp mills, cyanide plants, and metallurgical works other than iron and steel mills have been compiled and published. These figures supplement those on accidents at coal mines, metal mines, quarries, and coke ovens, and are the first detailed statistics on accidents at metallurgical plants that have been prepared in this country.

Improvement of mining laws and regulations.—In its efforts to aid the enactment of State laws to increase safety and efficiency in mining and the mineral industry, the bureau has published digests of court decisions bearing on laws relating to mining, and is now publishing, with annotations giving all important court decisions, the Federal statutes that relate to mining.

Some urgent needs of the Bureau of Mines.—At no time since the bureau was established has it had funds and facilities adequate to meet the many legitimate demands made on it for investigations relating to greater safety and efficiency in the mineral industries. Not only have the number and urgency of these demands increased more rapidly than the ability to meet them, but the lack of necessary equipment has at times embarrassed the bureau in its efforts to save the lives of miners. To meet these urgent needs facilities should be provided as soon as practicable.

An act of Congress, approved March 3, 1915 (40 Stat., 959), directs the Secretary of the Interior to establish and maintain in the important mining regions of the United States, under the Bureau of Mines and in accordance with the provisions of its organic act, 10 mining experiment stations and 7 mine safety stations, the latter movable or stationary, in addition to those already established. These stations are to make investigations and disseminate information with a view to improving conditions in the mineral industries, safeguarding the lives of workers, and preventing unnecessary waste of resources. The act provides that not more than three of the mining experiment stations and not more than three of the mine safety stations shall be established in any one year.

Under this law three mining experiment stations can and should be established during the current year, each in an important mining center where investigations will increase the yield of metals now being mined or will result in the mining of deposits now unworked. It is proposed that each station shall investigate the problems that particularly concern the development and utilization of the mineral wealth of the region in which the station is situated, and it is expected that each State in which a station is situated will cooperate in the study of mining problems that are local or concern that State by supplementing the appropriations made by Congress. The wording

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of the act will prevent duplication of work at different stations and will coordinate all investigations to the best advantage of the public.

Some of the problems that should receive the special attention of these stations are improvements of metal-mining methods, to insure larger recovery of ore and better safety and health conditions for miners; investigations of metallurgical processes for the treatment of ores, with the object of eliminating losses that now amount to millions of dollars annually; and investigations of methods or processes whereby mineral deposits now unworked can be made sources of national wealth.

Each of the three new mine safety stations is to have headquarters in a region where facilities are now lacking for rendering prompt and effective aid at times of mine disasters or for conducting demonstrations and training in first-aid and rescue methods, such as have already reduced the loss of property in mine disasters, lessened the sufferings and the period of disability of victims of accidents, and saved men entombed by mine disasters.

The per capita value of the yearly contribution of each worker in the mining and mineral industries is much greater than that of each worker in the agricultural industries, including forestry; so also is the contribution of the mineral industries to the freight tonnage of the country as compared with that of agriculture. But enormous quantities of low-grade ore lie unworked because of the lack of profitable methods of obtaining the contained metals, and the losses and wastes in the development and utilization of the country's mineral resources are estimated to exceed $1,000,000 a day. Improved methods of mining, treating, and utilizing our mineral resources are essential to the upbuilding of the regions in which these resources lie, to the increase of our national wealth, and to our industrial independence among the nations of the earth.

In the coal mines of this country last year there were 748,000 persons employed, of whom 2,785 were killed and 128,000 were injured. In the metal mines 193,000 persons were employed, of whom 683 were killed and 32,970 were injured. The total number of persons employed in all the metallurgical plants, including iron and steel works, is unknown, but in stamp mills, cyanide plants, smelters other than iron blast furnaces, 35,550 persons were employed, of whom 6,270 were injured. In the mineral industry as a whole it is probable that during the year more than 4,000 persons were killed and 200,000 were injured. These figures show the need of continuing and extending the work for greater safety that the bureau has been carrying on, for as yet the bureau has been able to reach directly, through the educational work conducted from its stations and cars, only a small percentage of all the 2,300,000 workers in the mineral industries of the United States.

TERRITORIES.

Since the transfer under Executive order of July 15, 1909, of the supervision of affairs in Porto Rico to the Insular Bureau of the War Department the former Territories of New Mexico and Arizona have been admitted as States, and there now remains under this department the supervision of but two Territories—Alaska and Hawaii.

ALASKA.

General conditions.—The report of the governor shows that during the fiscal year Alaska has made substantial progress in the development of its natural resources. There was greatly increased mining activity in the southeastern and southwestern sections, and increased attention was given to agriculture in different districts of the Territory. Conspicuous features of the mining progress made in Alaska were the continued development on a large scale of lode mines in the southeastern division, where there are now a number of the largest producing gold mines in the United States, and the heavy increase in the production of copper, due to the sharp advance in the price of that metal during the last half of the fiscal year. As a result all the copper mines of the Territory have resumed work, and there is a steady shipment of ores to the States for treatment. There are no smelters for refractory ores in Alaska and these are shipped elsewhere for treatment. During the present year some of the high-grade copper ores have been shipped to as far distant points as Salt Lake City, Utah. With the opening of the coal mines it may be expected that smelters will be built in Alaska, as excellent coking coal is found in the coal fields of the Matanuska and Bering Rivers.

General business, mining, fishing, commercial, industrial, and economic conditions may be said to have been fairly satisfactory during the year. Its people have faith in their country and are building homes and establishing permanent communities, but there is still too much bureaucratic control and direction of the Territory's affairs and resources. The official red tape, which in times past was wound about nearly everything pertaining to Alaska, was such as to strangle the efforts of the individual and subject him to injustice and hardships that were both burdensome and grievous. This condition has been abated to some extent, but there is still need for improvement in this respect. All matters bearing a natural relation to Alaska should be treated from within it and not by a multiplicity of bureaus thousands of miles distant from the Territory.

Mining.—The placer gold production for the current year, 1915, promises to exceed that of the previous year. The placer mining season of 1915 has been satisfactory, there having been an abundant rainfall in most of the mining districts. Two new mining districts

have attained some prominence during the year, and increased gold production in a number of others is noted. The use of dredges in the recovery of placer gold is increasing, and there are now in operation on Seward Peninsula, northwestern Alaska, about 40 of these dredging machines. Their use is also being extended to other districts. In interior Alaska and in the northwestern region there is a large field for the operation of power dredges, but the low-grade placer areas of interior Alaska will not be developed, in a large way, until cheaper transportation and cheaper power are afforded. The first will be provided by the Government railroad from Seward, on the coast, to the Tanana Valley, work on which was begun the past summer, and by wagon roads and trails. Cheaper power will be furnished by the development of interior coal fields and water powers. These great alluvial gold deposits will not be exhausted in a century or more.

Agriculture.—It has been demonstrated that Alaska possesses great agricultural possibilities. The Territory is gradually securing an agricultural population, which is reclaiming the wilderness and establishing homes. During the past year hundreds of homesteads have been located, crops of various kinds have been planted, live stock is being raised, dairies have been started, and an era of permanent agricultural development has been ushered in. It is not improbable that Alaska may in the course of years become an exporter of agricultural and dairy products. It is certain that the Territory's agricultural resources are such as to warrant the prediction that within a few years it will produce sufficient farm products to supply home consumption, with the possible exception of wheat. Alaska needs population that its latent resources may be made productive; and to accomplish this access to the Territory's lands should be made as free as possible. The man who is anxious to till the soil is fairly entitled to such encouragement as it is possible for the Government to give him. Unnecessary restrictions should be removed and the fullest information concerning available agricultural lands, their location, nature of the soils, estimates of the cost of development, and other practical and accurate information should be furnished to the intending settler without cost. Surveys of farm lands should also be made free of cost to him. It has been estimated that Alaska has 30,000 square miles of agricultural lands besides large areas suitable for grazing. Two-thirds of these areas are probably tributary to the proposed Government railroads. In all the coast towns of Alaska increased attention is being given to raising vegetables for home consumption and the market. There are numbers of truck farms in the vicinity of Haines, Skagway, Juneau, Seward, Valdez, Sitka, and other towns, whose products find ready home markets. The town of Haines, on Lynn Canal, has a wide reputation as a producer of

cultivated strawberries, and the town of Skagway annually holds an agricultural and horticultural fair, where the finest varieties of vegetables, small fruits, and beautiful flowers are shown. At Fairbanks annually is also held the fair of the Tanana Valley Agricultural Association where excellent displays of the various products of the farms and gardens of this section may be found.

Population.—The white population of Alaska is estimated at 44,000, an increase of 5,000 over the estimate contained in the report for the fiscal year 1914, the increase being largely confined to the coastal divisions. According to the census of 1910 the population of Alaska was 64,356, of which 25,331 was returned as Indian. The Indian population is probably slowly decreasing, except possibly in southeastern Alaska, where the habits of life and sanitary conditions are better among these people than elsewhere in the Territory. The white population has been increasing steadily in southeastern and southwestern Alaska—the Pacific coast divisions—for the past several years. In other geographical divisions it has remained practically stationary, although it will probably be found that the population of the interior country, which suffered a decrease through the exhaustion of the richer placer areas, is again slowly increasing, due to the fact that a considerable number of people are engaging in agricultural and other pursuits.

Alaska has 16 incorporated towns; and reports received from 11 of these, which caused an assesment of property to be made and a tax levied in 1914, show a total assessed valuation of $12,546,494. The tax rate of these 11 towns ranged from 0.6 of 1 per cent to 2 per cent, the average being 1.28 per cent.

Fisheries.—The first Alaska industry to be developed was its fisheries. The Russians engaged in fishing, but their efforts to develop the industry were necessarily limited. But in comparatively recent years, however, the fisheries have developed into a great industry that has made salmon and other of its fishery products known to many nations and have produced values of approximately $20,000,000 per year; and since the purchase of the Territory in 1867 it has produced fisheries products to the value of $254,000,000, almost equaling the total value of the mineral output during the same period. The chief importance of the fisheries lies in the salmon industry. Next in importance is the halibut fishery, which, as yet, has been only partially developed, and which offers great promise in the future. The herring fishery is also important, and many other food fishes abound in the waters of Alaska. The whale fishery is of considerable value, and there are numberless quantities of clams, mussels, and shrimps. A feeling of apprehension has arisen on the part of some people as to the future of the fisheries industry of Alaska, it being alleged that the waters of the Territory are now being ex-

ploited in a commercial way to an extent that will result in serious permanent depletion before many years. It is true that in some isolated instances the number of fish has apparently decreased, and this applies particularly to salmon. Generally speaking, however, the waters of Alaska are still as richly productive as they were formerly. The supply of fish is subject to seasonal fluctuations, and if the production falls off in any one particular year, it does not necessarily follow that the fishery is being too vigorously prosecuted. To adequately conserve and protect this industry competent and careful regulation by the Government is necessary. The Federal Government in its administration of the fisheries of Alaska has always been severely hampered by a lack of funds and a personnel of sufficient proportions to cover the vast extent of the Territory's fishing areas. The most trying feature of this is the failure of Congress to realize the necessity of providing a fleet of patrol boats so urgently required in looking after and protecting the fisheries of the Territory. At the present time the United States Bureau of Fisheries (which service is charged by law with the enforcement of the fisheries regulations and the conduct of all matters, both scientific and economical, pertaining to the fisheries industry in Alaska waters) has but one small boat in its service; whereas there ought to be a fleet of at least 10 such boats for even the most urgent requirements. This need of additional patrol boats should be given most serious consideration by Congress.

The Federal Government maintains and operates two salmon hatcheries in Alaska, while five are owned by companies engaged in the canning of salmon. For each 1,000 of red or king salmon fry released these companies are allowed a remission of 40 cents of the Federal fisheries tax. For the fiscal year 1915 rebates to the amount of $25,741 were credited to the operators of the private hatcheries for 64,355,380 red salmon fry released. During the same period the two Government hatcheries released 51,163,100 young red or sockeye salmon, making a total of approximately 120,000,000 young sockeye salmon released to the waters of Alaska during the year. In addition about 17,000,000 humpback salmon fry were planted by the Government. The Government should own and operate all salmon hatcheries, and provision should be made by Congress at the earliest possible time for taking over these private hatcheries and committing their operation to the Government. The total investment in Alaska fisheries in 1914 was $37,038,632, and the total fisheries product was valued at $21,242,975. This is the greatest the industry has ever shown in any one year. The pack of salmon was 4,056,653 cases, valued at $18,920,589. There were 21,000 persons engaged in all branches of the fisheries industry in Alaska in 1914. This number was made up of 11,178 whites, 4,184 Indians, 2,138 Chinese, and

2,382 miscellaneous, under which head are included Filipinos, Mexicans, Koreans, and some others. In 1914 there were 81 canneries in operation, a gain of 2 over the previous year. The first salmon cannery in Alaska was erected in 1878. In 1914 the total investment in Alaska salmon canneries was $30,834,435, and employment was given to 16,307 persons.

In addition to the canning of salmon there are several other important branches of the industry, such as mild curing, hard pickling, freezing, and marketing in a fresh condition. The most important of these is the mild-curing industry. There was considerably less mild curing done in 1914, as the war in Europe destroyed the principal market for this product. Immediately upon the beginning of hostilities all mild-curing work was discontinued. Advance figures have not yet been obtained for operations in the season of 1915, but in a general way it is known that all preliminary work in southeastern Alaska showed much more satisfactory results than were experienced last year, while in western Alaska it is apparent that there will be quite a decrease in the production of salmon in that section.

A thorough system of inspection of the products of the salmon canneries should be inaugurated. While some of the canneries are models of sanitary perfection there are others which are not, and the products of all suffer because of the negligence on the part of those cannerymen who do not exercise proper care in the selection of the fish or in the canning process.

Eighty-five per cent of the halibut consumed in the United States comes from the Pacific coast, of which Alaska furnishes a large share. Some of these fish are not shipped through Alaskan ports, but their source of supply is, nevertheless, the rich halibut banks off the coast of the Territory.

The recent opening of the Grand Trunk Pacific Railway from Prince Rupert, British Columbia, direct to the East may lessen the quantity of halibut handled through Ketchikan, which is the principal center of the industry in Alaska. It is not so much a question of individual or independent fishermen suffering any serious loss as the result of the bid which Prince Rupert is making for the control of the halibut industry, for the fishermen may sell their catch where they can obtain the best price; but it is, however, the concerns buying and freezing halibut in Alaska that may be hurt as a result of being forced to compete with the Prince Rupert companies, which have a distinct advantage in the matter of transportation to the markets of the East. The merchants of southeastern Alaska who deal in supplies used by halibut fishermen will feel to a certain extent also the loss of trade, although it is not believed that this will be as serious or will be felt as much as may seem apparent at this time. The privileges of shipping in bond are such that fish may be sent through

Prince Rupert to points in the United States duty free. The granting of terminal rates by the Grand Trunk Pacific Railway to shippers of halibut at Ketchikan, 90 miles distant, would do much toward insuring the retention of the business to the southeastern section of Alaska, but the granting of such rates and privileges can scarcely be expected in the immediate future

In the season of 1914 there were 18 large schooners and 5 smaller vessels engaged in the cod fishery in Alaska. A successful season was experienced and good prices were realized on the season's production. There is a great opportunity for the expansion of the cod fishery of Alaska, as there are many cod-fishing banks that are scarcely touched. The total investment in the Alaska cod fishery in 1914 was $632,921. These figures include both the off-shore and the shore stations operated in Alaska. The number of persons engaged in this fishery was 677. The products aggregated 15,045,378 pounds, valued at $438,208, as compared with the production of 11,916,900 pounds, valued at $357,711 in 1913. This shows a substantial increase for 1914.

Quite an extensive herring fishery has been developed in Alaska, but it is by no means of the proportions possible, considering the quantities of fish available. For food purposes the herring of Alaska are practically the equal of the Norway or Scotch herring. The industry, however, in Alaska has not been developed to its fullest possibilities, and the cause has heretofore been due to the negligence displayed by those engaged in the industry as to their methods of preparing the fish. The situation in the last year or two has improved, and it is hoped that before long the herring fishery of Alaska will be developed on much more extensive lines. For years a company operating at Killisnoo, southeastern Alaska, has made extensive use of herring in the preparation of oil and fertilizer, and it has been charged that the activities of this plant have resulted in a decrease in the number of herring in those waters. It is hardly probable that any serious depletion has resulted from the use of herring at this Killisnoo plant, nevertheless it is believed advisable and proper to prohibit the use of herring for such purposes, a reasonable amount of time being given to the concern to close up its affairs.

The whale fishery in Alaska in 1914 was conducted chiefly from two shore stations, which killed and utilized a total of 482 whales. The total investment in the shore-whaling industry in Alaska in 1914 was $1,456,649. The number of persons employed was 225, and the value of the product was $291,099. Four vessels were also employed in whaling operations in the Arctic last year. The value of their catch was $26,250.

Agricultural experiment stations.—The Government agricultural experiment stations in Alaska are doing an excellent work and their

sphere of usefulness should be greatly enlarged; to do this, however, the appropriation for the prosecution of the work should be doubled. The growing demands of the Territory along agricultural lines render this increase most desirable, if the best results are to be obtained and agriculture encouraged and fostered. The distinguishing feature of Government agricultural work during the season of 1915 was favorable weather, and this condition was conducive to the growth of vegetables, fruit trees, and fruit bushes, except in the interior, where there was a deficiency in the rainfall. There are four agricultural experiment stations in Alaska, located, respectively, at Sitka on Baranof Island, Kodiak Island, Rampart on the Yukon River, and Fairbanks. The Sitka station is devoted exclusively to horticultural work, the Rampart station to grain breeding and growing and testing of forage crops, particularly hardy alfalfas. The effort of this station is to develop varieties of grain which shall be better suited to Alaska than anything that can be obtained from a more southerly clime. Fairbanks station is devoted to demonstration work, the effort being to operate it as a model farm for the instruction and benefit of farmers in the Tanana Valley. Grains of many kinds are grown on a comparatively large scale, there being about 100 acres under cultivation. All of these grains matured this season, but the straw was short and the yield light. Galloway cattle and sheep are raised at the Kodiak station. The light rainfall of the present year was the cause of a short hay crop, and the dry spring and high winds caused much of the volcanic ash to drift and blow away from the roots of the young grasses seeded last year. Aside from this, the work of the development of the station progresses favorably. A site has been selected for an experiment station in the Matanuska Valley not far from the junction of the Matanuska branch of the Government railroad with the main line. No work can be done there this fiscal year for lack of funds. Many hundred homesteaders have taken up farms in this region, and the experiment station is needed, because the conditions of soil and climate differ materially from conditions found elsewhere in the Territory.

Reindeer industry.—The reindeer industry in Alaska had its beginning in 1892, when a few reindeer were imported from Siberia, and its success has been amply demonstrated. It has placed many of the native inhabitants beyond the reach of the grim want which always faced them during the long winter season. It has taught them to be industrious and to assume certain responsibilities in life. But there is still need of the extension of the industry. There are thousands of natives in the delta country between the Yukon and Kuskokwim Rivers and in the Aleutian Islands who can be saved from possible extinction by the introduction of reindeer among them

and by teaching them how to care for the herds and themselves. These natives, generally speaking, are always on the borderland of destitution, if not actual starvation. The Eskimos of the northern shores of the Bering Sea region have probably been saved from extinction by the reindeer, and a more general distribution of these animals will perform a like life-saving work among the natives of other sections who have not been reached. At the end of the fiscal year 1914 there were 57,872 reindeer distributed among 65 herds, 66 per cent of which were owned by 980 natives, 7 per cent by the United States, 10 per cent by the missions, and 17 per cent by the Laplanders. The total income of the natives from the reindeer industry for the fiscal year, exclusive of meat and hides used by themselves, was $77,934. The herds increased 22 per cent during the year. Heretofore no special endeavor has been made to foster the exportation of reindeer meat from Alaska in view of the fact that most of the reindeer butchered was required to supply local markets in northwestern Alaska. It appears now that such exportation is desirable. A few reindeer carcasses were shipped to Seattle from Nome at the close of navigation last year and placed on sale. The meat retailed at from 20 to 25 cents per pound. Exportation on a larger scale is expected this fall, when a corporation organized in the summer of 1914 at Nome, and which purchased 1,200 reindeer from Laplanders, will ship to Seattle, in conjunction with several native reindeer owners, about 1,000 carcasses. A systematic effort will also be made to introduce this product throughout the United States. A specialist of the Bureau of Animal Industry visited northwestern Alaska last year and consulted with the officers of the Bureau of Education as to the best means of improving the industry and the manner in which the problems were to be met, such as the ailments of the deer, exportation of meats, etc. Northwestern Alaska presents an almost unlimited field for the raising of reindeer, and if a market can be found for the product the industry is capable of great expansion. The meat is delicious and has been found to be a good substitute for beef.

Railroads.—The Alaska Engineering Commission, which is charged with the work of constructing a system of railroads in Alaska from the town of Seward, on the coast, to the Matanuska coal fields and interior Alaska, began the actual work of construction at Anchorage, on Cook Inlet, last spring. Owing to unexpected delay, the Alaska Northern Railroad, with its coast terminals at Seward, which was purchased by the Government, was not taken over until August, and only necessary repair work was done on that line during the summer. Work on the Government railroad from Anchorage toward the Matanuska coal fields has been prosecuted with success, when all the difficulties confronting an enterprise of this kind in a remote country are considered. The construction work also included the laying out

of a town site at Knik Arm, Cook Inlet, the erection of administration and other buildings, and the assembling of supplies, all of which has gone forward with commendable dispatch. Construction and other initial work can be done during the winter if the funds necessary for prosecuting it can be secured by appropriation from Congress. The task of making permanent surveys was continued during the summer. There has been no other railroad construction during the year. The total railroad mileage of the Territory is 446 miles, but the only railroads regularly operated are the White Pass & Yukon Route, 20.6 miles; Yakutat & Southern (a private railroad), 9 miles; Copper River & Northwestern Railway, Cordova to Kennecott, 195 miles; and the Tanana Valley Railroad, Fairbanks to Chena and Chatanika, 46 miles. The business of the Copper River & Northwestern Railway has increased largely during the year, owing to large shipments of copper ore from the copper mines of the Copper River Valley. Operation of the Government system of railroads at the earliest possible time is a matter of prime importance to the Territory. Although the work of construction may be said to have only fairly begun, there has been a large influx of people to the Territory, not all of whom are looking for employment, as many have come with the purpose of becoming permanent settlers.

Health conditions of natives.—There is little change to report in the health conditions of the natives of Alaska, these being much the same as in the previous fiscal year. The United States Bureau of Education continued to do what it could to alleviate the sufferings of the native population by diverting a part of its educational fund into medical channels. A medical force is maintained in certain localities, but it is entirely inadequate. Congress has appropriated the sum of $25,000 for the relief of natives for the fiscal year ending June 30, 1916. This is but a "drop in the bucket," but it is a step in the right direction. An appropriation of at least $125,000 annually is needed to establish a tuberculosis sanitarium and several hospitals at centers of native population, these institutions to be equipped and located at accessible places, together with the employment of a sufficiently large corps of physicians and nurses, to make it possible to reach the greater part of the native population. In addition to $25,000 for medical relief appropriated by Congress, the Bureau of Education has set aside $20,000 from its educational fund for medical relief. With this total of $45,000 the bureau is constructing a hospital in Juneau, in addition to maintaining its present medical force in other sections of Alaska.

In all districts where Indians are located there are always to be found old and decrepit men and women who are unable to earn a livelihood and who receive scant consideration from their relatives and who frequently suffer from lack of food. An appropriation to

relieve the necessities of these Indian indigents and dependents should be made by Congress to be expended under the direction of the Bureau of Education. There is a section of Alaska which contains several thousand natives remote from supply centers. This is the low, flat, marshy country comprising the delta region between the mouths of the Yukon and Kuskokwim Rivers. The conditions that obtain among these natives call loudly for amelioration. Their remoteness from the centers of civilized life make them an easy prey of unscrupulous white and native traders, who not only furnish them with intoxicating liquors, but encourage them to distill a native drink paralyzing and frequently deadly in its effect. These Indians need special attention. They are different from the average Indian or Eskimo of the North. They have never known the white man except as they have come in contact with missionaries, who occasionally visit them, and white traders. They are kind and peaceable and can be taught to be industrious, honest, and reliable members of the native population, but to accomplish this the complete abolition of the making of intoxicating drinks by native traders and others and the consolidation of the scattered villages of underground igloos into community centers, at desirable and sanitary locations, is essential. A special agent for the suppression of the liquor traffic among the natives should be permanently stationed in the delta country.

Aids to navigation.—During the fiscal year ended June 30, 1915, the Lighthouse Service of the Department of Commerce added 5 new lights to the number of aids to navigation in Alaskan waters, 2 lights were improved, and 10 buoys and 5 beacons were established. In addition to the foregoing, new lights will be established in the near future at a number of other places. A lighthouse is in course of construction at Cape St. Elias on Prince William Sound. The necessity of a thorough system of charting the navigable channels and water routes of the coast of Alaska by means of drag nets is again emphasized. Some work was done along this line during the present summer, and a number of new menaces to navigation in the form of "pinnacle rocks" were located. One steamer was wrecked during the past fiscal year, having been stranded on Strait Island. Fortunately no loss of life occurred. The commerce of Alaska is growing rapidly and many additional steamers are being added to the transportation fleets for passenger and freight service, and the importance of thoroughly safeguarding the navigable waters of Alaska's coast is emphasized.

Fur-bearing animals.—The killing of fur seals in the Pribilof Islands during the fiscal year was limited to the number of male seals necessary for food purposes of the native inhabitants. During the calendar year 1914 there were killed for these purposes 2,735

seals. Reports of the number of seals killed during the last half of the fiscal year 1915 have not been received. The department fixed upon 5,500 as the number of seals to be killed for food during the calendar year 1915. Increased facilities for preserving seal meat for winter use have been provided. This will reduce to some extent the amount of other forms of preserved meat to be purchased by the Government for the natives. The annual shipment of fur-seal skins and fox skins from the Pribilof Islands was made in October, 1914. The shipment consisted of 2,884 seal skins, 256 blue fox skins, and 25 white fox skins. Owing to the condition of the fur market these skins were not offered for sale at the usual time, Congress having authorized a postponement of the sale until such time as should be deemed advisable. A census of the seal herd taken in 1914 showed a total of 294,687 seals, a gain of 26,382 over the census of the previous year. The administration of the law and regulations for the protection of the minor fur-bearing animals was carried on by the Bureau of Fisheries through its wardens, and efforts were made to have these wardens include in their field of operations as much of the Territory as possible. Additional legislation is required for the conservation of wild fur-bearing animals. The shipping of wild fur-bearing animals from Alaska should be regulated, as should also the indiscriminate digging by irresponsible parties of young foxes from their nests for the ostensible purpose of utilizing them for fox farming. Bills were introduced in both the second and third sessions of the Sixty-third Congress for the purpose of amending the fur law, but they failed of passage. The total value of the furs shipped from Alaska during the fiscal year 1915, with the exception of shipments of fur seal and fox skins from the Pribilof Islands, was $649,629.90. Fur farming in Alaska has been in a somewhat depressed condition during the year as a result of the European war and the prevailing low prices for furs of all kinds. Nevertheless a number of farms have been established in various parts of the Territory, both on the coast and in the interior. Where due care is given to the selection and breeding of foxes the industry is a success.

Mineral springs.—There are many mineral springs, both hot and cold, scattered throughout Alaska, both on the coast and in the interior. Few of these are utilized, however, except in a small way. Uncertainty of title to lands on which these springs are situated has been the principal factor in retarding their development and use. Provision should be made for the development and utilization of some of these springs either by the Government or by leasing them to responsible persons.

Alaskan insane.—The insane persons of Alaska are cared for at Morningside Sanitarium, under a contract entered into between the Sanitarium Co., of Portland, Oreg., and the Secretary of the Interior.

The number of Alaska insane under treatment June 30, 1915, was 180, of which 156 were males and 24 females. The Alaska Legislature at its 1915 session adopted a memorial for presentation to the Congress asking, among other things, that a permanent asylum be established at some point on the Pacific coast of Alaska to which the Alaska insane patients can be removed from the interior of the Territory for permanent care and custody, unless sooner discharged, and to which institution the Alaska insane now in the Morningside Sanitarium can be transferred. Morningside Sanitarium is inspected frequently by inspectors of the Department of the Interior and the governor of Alaska. The number of patients confined in the sanitarium is increasing, and with the increase of population in the Territory the number of insane will undoubtedly become larger from year to year. The contract system of caring for the insane of any country is inherently bad no matter with what fidelity the provisions of the contract are sought to be carried out. It has been urged that the climate of Alaska is such as should, for humane reasons, if for no other, be sufficient argument against caring for the insane of Alaska in the Territory. This argument is not sound. The climate of Alaska is not productive of insanity any more than is the climate of the States of Washington or Oregon, and the confinement of patients in a well-conducted institution located in the Territory would be conducive to both the mental and physical comfort of the inmates. Most of these patients have no other home than Alaska, and the friends they have are for the most part in that territory. Provision should therefore be made at as early a date as possible for the care of the insane of Alaska within the Territory.

Detention hospitals for the temporary care of the insane of Alaska were constructed at Nome and Fairbanks in 1913. These hospitals, however, have been of little service for the reason that no appropriation has been made for their maintenance, and therefore they have not fulfilled the purpose for which they were intended. Such appropriation should be made; if not they should be closed as, at present conducted, they are a source of expense without adequate benefit, inasmuch as each requires the services of a caretaker whether the building is occupied or not. Under the law when persons are arrested on charges of insanity they must be given a speedy trial, and they are either freed or committed to the Government contract hospital near Portland, Oreg. If found insane, it has been the custom to transport them as soon as possible to Portland, where it may be some of them soon recover. If these detention hospitals were utilized and those committed to them were detained there under medical observation and given proper medical treatment, it is possible that they would soon recover and be discharged, thus avoiding

the high cost of transportation to the contract hospital and the cost of their maintenance at that institution.

Labor conditions.—The supply of labor in nearly all the industrial sections of Alaska exceeded the demand, the influx of labor being stimulated by the beginning of construction work on the Government railroad at Anchorage, on Cook Inlet. A considerable portion of this labor was absorbed in railroad work and mining, farming, and prospecting. The mines of southeastern Alaska give employment to a large number of men, and it is expected that the opening of some of the coal fields of Alaska will extend the volume of mining operations throughout the Territory through the furnishing of coke and cheaper fuel for industrial use. The fishing industry gave employment to the usual number of men; in this industry many Indians and Chinese, Japanese, and other aliens are employed.

The Territorial legislature at its 1915 session passed an eight-hour law for all workers in lode and placer mines, and during the past summer in the Ruby and Fairbanks mining districts labor strikes resulted in some of the placer mines, when the employers attempted to reduce the wage scale which had been paid for a 10-hour day. The strike, however, was of short duration. The scale of wages paid in lode mines in coastal Alaska is from $3 to $3.50 per day.

Game law.—The Alaska game law needs revision in many important particulars. It is unsuited in many respects to local and climatic conditions in the different geographical divisions of the Territory. For instance, a law that is suitable for the southern sections is entirely unsuited to the interior and northwestern sections. A peculiarity of the law is found in the fact that black bears are classed as "fur-bearing animals," the administration of this law being assigned to the Department of Commerce, and they may be killed at any time, while the brown bear is classed as a "game animal," is rigidly protected, and is under the supervision of the Department of Agriculture. The brown bear is a destructive animal, while the black bear is inoffensive. Evidence of the rapacity of the brown bear is illustrated by the fact that 40 of a flock of sheep numbering 42, belonging to the Government agricultural station at Kodiak, were killed by brown bears; 2 of the sheep escaped with mangled ears and other mutilations. This species of bear should not be protected. The raising of cattle and other domestic animals on Kodiak Island is threatened and probably will be abandoned unless the brown bear which inhabit the island can be practically exterminated. Alaska is the last great game country of the United States. There are still large numbers of moose, deer, and caribou, as well as a fair number of mountain sheep and goats. These should continue to be rigidly protected, for the game of Alaska is a now valuable asset of the Territory and will increase in importance with the pass-

ing of the years. The administration of the Alaska game law is under the direction of the governor of Alaska. Nine game wardens were employed in the protection of the game of the Territory during the fiscal year.

Cable and telegraph lines.—There were numerous interruptions of the military cables between Alaska and Puget Sound during the fiscal year, due to breakages. As a matter of fact, the cables are steadily deteriorating through age and attrition, and breakages may be expected to increase. New cables should be laid in the near future, and an additional cable connecting the various coast towns with Puget Sound should be provided. The cable and land telegraph lines are under the direction of the United States Signal Corps, and the service rendered continues to be satisfactory. The rates on commercial messages were reduced 25 per cent during the year, and a night service was also established in some of the coast and interior cities. The wireless stations maintained by the War and Navy Departments continue to give excellent service. Some of these have been greatly improved, and their field of usefulness is widening each year. The importance of these radio stations in Alaska needs scarcely to be pointed out. Alaska's commerce is increasing rapidly, and the importance of the Territory from a naval standpoint will inevitably increase with the development of its resources, and a rapid gain in trade and commerce may be reasonably expected. New stations should be erected at suitable places, and none should be abandoned.

Territorial legislation.—Persons in Alaska who are indigent and incapacitated through nonage, old age, sickness, or accident are given such relief as may be necessary through the operation of an act of Congress which provides that 10 per cent of the Alaska fund, or as much thereof as may be necessary, shall be appropriated or expended for their relief by the judges of the different judicial divisions. An appropriation for the relief of the indigents of the Territory is also made by the Territorial legislature. What is, in effect, an old-age pension law was passed by the second Territorial legislature. The act provides that any person, male or female, who has resided for 10 consecutive years or more in the Territory, and has reached the age of 65 years, and who is unable by reason of physical disability to earn a livelihood, shall receive an allowance not to exceed $12.50 per month from the Territorial treasury.

The second Territorial legislature convened on March 1, 1915, the session being limited by the organic act to 60 days. Seventy-eight laws covering a wide range of subjects were enacted and approved, and six were vetoed by the governor; a number of laws passed by the first legislature were amended, or repealed, and a large number of memorials were addressed to the Congress. Of the more important laws enacted mention may be made of a workmen's com-

pensation law; a law providing for a uniform ballot for Territorial elections; an eight-hour-day law for all workers in the mines of the Territory; and a law providing for local self-government in Indian villages. The intention of the latter law is to prepare the Indians for citizenship. An act was also passed providing for submitting to a vote of the people the question of prohibiting the manufacture and sale of intoxicating liquors within the Territory. It will be submitted at the general election in November, 1916.

A home for aged prospectors and others who have spent their years in Alaska and become dependent was established, by act of the Territorial legislature, at Sitka in 1913. It is maintained by Territorial funds for the most part. The number of inmates of the home on the 1st day of September, 1915, was 47.

Banks.—There are 11 banks operating under the banking laws of the Territory. These banks are under the control of a Territorial banking board composed of the governor, the Territorial treasurer, and the secretary of Alaska, and are subject to examination once a year, or more frequently in the discretion of the banking board. There was one small bank failure during the year. There are three national banks in Alaska.

Oil fields.—The discovery of petroleum was reported in August of this year at a point between Wainwright Inlet and Point Barrow, northern Alaska, the extent of which has not been determined. Seepages of oil were found near the head of Smith Bay, southeast of Point Barrow, a number of years ago but no investigation of the field other than casual has been made. It is quite probable that an oil field of considerable merit may exist in that region, but its remoteness will undoubtedly prevent its development for some time to come. The only oil-bearing area in Alaska that has been exploited to any extent is located at Katalla, on Prince William Sound. A number of wells have produced a limited amount of oil at this point for a period of years, and a small refinery is in operation.

Mail service.—The mail service of Alaska may be said to be generally satisfactory except in the interior sections where there is always more or less complaint of inadequate and inefficient service during all seasons of the year, but particularly in the open season of navigation. All of these complaints are not groundless. The people of the interior towns of Alaska should have the best mail service possible, and the mail carried should include other than that of the first class, which is frequently excluded under the winter schedules.

Revenues.—The revenues which are derived by the Federal Government from business and trade licenses outside of incorporated towns in Alaska, and which are passed to the credit of the Treasurer of the United States and by him credited to what is known as the Alaska fund, under act of Congress approved January 27, 1905, amounted

to $260,256.53 during the fiscal year. This represents a decrease of $59,126.41 for the year 1915. Sixty-five per cent of the moneys paid into this fund is appropriated for the construction or repair of roads and trails outside of incorporated towns; 25 per cent for the maintenance of schools outside of incorporated towns, and 10 per cent for the relief of indigents under the act of Congress approved March 3, 1913.

Surveys.—The importance of continuing the surveys of agricultural land in Alaska can not be overestimated. The demand for these lands is increasing with remarkable rapidity. Hundreds of homesteads have been located during the year, some on unsurveyed and some on surveyed lands. These homesteaders should receive encouragement at the hands of the Government, and one way in which to aid them is to survey, without cost to themselves, the land they have entered upon. This is not done under the system now followed, except on land within the national forests. The policy instituted by the Department of the Interior in causing a survey and allotment of lands claimed by Indians, should be continued, and when the allotments shall have been made the Indians should be encouraged to cultivate the lands allotted to them with a view to permanently attaching them to the soil.

Metlakahtla Indians.—The legal status of the Metlakahtla Indians remains unsettled. In 1887 they immigrated from British Columbia and settled on Annette Islands, Alexander Archipelago. These islands were set apart as a reservation for their use by act of Congress, approved March 3, 1891, and the act also provided that the lands should be used and held by these Indians in common under such rules and regulations and subject to such restrictions as might be prescribed from time to time by the Secretary of the Interior. It was not, however, until the present year that rules and regulations were prescribed for the government of the community, these having been formulated in February last by the Secretary of the Interior. A school established by the United States Board of Education in 1913 is largely attended by the native children. New school buildings were erected during the present year. Legislation is needed defining the political status of these Indians and to enable them to attain citizenship should they possess the necessary qualifications. Surveys of lands of the Annette Islands should be made and the Indians given title to them in severalty.

Militia.—As yet Alaska has no militia or other military organization. In 1903 the War Department decided that no useful organization of the militia in Alaska could be perfected under the existing law, which was regarded as obsolete, and it was therefore recommended that no organization of the militia be attempted in advance of appropriate legislation by Congress. At the same time the War

Department was of the opinion that it was both practicable and desirable to maintain a force of the militia in Alaska, particularly in the vicinity of Juneau. The matter has rested there, for no effort has been made to remove the obstacle referred to by the War Department in the way of organizing the militia of the Territory. The time seems to be opportune for such organization, and if this can be effected a force of militia 1,000 or more in number can be enrolled, whose personnel would include men of previous experience in the militia of various States and who are now seasoned Alaskans.

Commerce.—The volume of merchandise shipments, including precious metals and copper, between Alaska and the United States and between the Territory and foreign countries for the fiscal year 1915 amounted to $70,113,916, as compared with $61,076,692 for the fiscal year 1914, an increase of $9,037,224 for the fiscal year 1915. Shipments of domestic merchandise from the United States to Alaska showed a decrease of $1,136,851 from the previous fiscal year, while shipments of domestic merchandise from Alaska to the United States increased $5,406,519, and shipments of domestic gold and silver increased $3,172,154; shipments of foreign gold and silver increased $928,588; and the value of fish shipments of all kinds showed an increase of $4,022,411. There was also an increase in copper production of $1,305,593 over the previous year.

Liquor traffic.—Operations for the suppression of the liquor traffic among the Indians were continued throughout the year under an appropriation made by Congress for this work, the amount available being $15,000. Four special employees were regularly engaged in the work during the fiscal year and one native officer. The results obtained by these special employees, generally speaking, have been satisfactory, not only in the number of arrests and convictions obtained, but also in the preventive work, whose value can not be estimated in mere figures. The districts covered by these special employees are extensive, and means of communication between objective points are not infrequently slow and uncertain. Power launches for the use of the special employees in the third and fourth judicial divisions, where much of the traveling must necessarily be by water, should be provided.

Wagon roads.—The importance of wagon road and trail construction in Alaska can not be too strongly emphasized A liberal policy on the part of the Government will enable the prospector and miner to reach the mineral zones of the Territory and develop mines which in turn will produce tonnage for railroads, while the farmer will be able to reach agricultural lands and develop them and make them productive. Such development can not take place unless such roads are supplied. No policy for the extensive development of the Ter-

ritory will be complete that does not recognize to the fullest extent the linking up of farms and mines, by means of wagon roads and trails, with towns already established or which may be established hereafter by reason of the development that will follow railroad construction. Liberal appropriations by Congress for wagon roads and trails will be national investment, inasmuch as it would mean an annual addition to the wealth of the Nation of millions of dollars. The expenditures on road and trail work by the Board of Road Commissioners for Alaska during the fiscal year amounted to $282,895.84, of which $157,895.84 was received from the Alaska fund and $125,000 from a special appropriation made by Congress. The total mileage completed June 30, 1915, was: Roads, 901.8 miles; sled roads, 577.5; trails, 2,216.5. The work of the commission was carried on during the year in the maintenance and repair of the roads in the Territory and the construction of such new roads as the limited fund available would permit. The Territorial legislature made provision for the expenditure of the accrued forestry funds due the Territory by Territorial road commissioners, and created four road districts coinciding with the four judicial divisions. The fund available is approximately $45,000. The use of this money should give some relief during the fiscal year 1916, but as the future annual return from this source will be small no considerable assistance can be expected from this quarter in the future.

Historical library.—In so far as practical use is concerned the Alaska Historical Library and Museum is a name only, for the most part, for the reason that the collection of books, maps, pamphlets, and ethnological and other objects, the accumulation of many years, are not wholly available for public use. The need of a suitable building for this purpose becomes more pressing with the passage of each year.

Schools.—Schools were maintained in 31 districts outside of incorporated towns during the school year 1914–15. Seven new districts were organized during the year, making a total of 38 at the beginning of the school year 1915–16. The organization of a number of other districts is pending, and, owing to a lack of funds, three new districts already established will be without school facilities during the school year 1915 unless more funds can be secured through Congress. The 31 schools maintained during the school year 1914–15 employed 40 teachers and had an enrollment of 961 pupils. The cost of maintaining these schools was $61,426.92. Twenty-five per cent of the Alaska fund is set aside each year for the support of schools outside of incorporated towns. The amount received from the Alaska fund for the support of schools depends upon what the business or trade licenses produce each year. It is, therefore, variable. The average sum needed to maintain a school outside of incorporated

towns is $2,000. Twenty-five per cent of the Alaska fund may produce $60,000 annually or it may not. During the present school year there will be at least 38 schools, requiring expenditures of approximately $76,000. There promises then to be a deficit in the amount necessary for their maintenance, and unless this deficiency can be supplied the only alternative left will be to close some of the schools or shorten the school term, which is now nine months. There will be available, however, for schools of the kind under discussion the sum of approximately $10,000 appropriated for school purposes by the Territorial legislature from Territorial funds, but even with this addition there will be a deficiency in the sum required. There may be expected to be a steady increase in the number of schools, and it is recommended that the percentage of the Alaska fund set aside for the maintenance of schools in Alaska be increased from 25 per cent to 50 per cent. If this is done, there will still remain 40 per cent of the fund to be used for road purposes and 10 per cent for the Alaska indigent fund. The education of the children who are growing up in Alaska should be considered a matter of first importance. They are an important asset, and it is in the Territory that they will assume the full duties and responsibilities of citizenship, and they should be prepared for it through education as completely as possible. The Territorial legislature at its 1915 session enacted two laws pertaining to the schools of Alaska. One of these provides for the creation of a board of education and for a uniform course of study for all public schools. Another act provides for the organization of school districts by United States commissioners instead of the clerks of the district courts, as at present, and reduces the number of children of school age necessary to constitute a school district to 10 instead of 20, as under the Federal law. As these laws amend the Federal law in important particulars, it is possible that they will be found invalid.

Forests.—The total receipts from the Tongass and Chugach National Forests for the fiscal year were $47,365.59, while the total cost of administering the two forests for the same period was $40,099.96. The total number of applications received for homesteads on the Tongass National Forest under the act of June 11, 1906, is 100. Of this number 42 were received during the last fiscal year. The total number received for lands on the Chugach National Forest is 188, of which 89 were received during the fiscal year 1915. The work of examining and reporting upon all of these claims is carried on by the local force of forest officers and can only be done to advantage for a short time of each year because of adverse climatic conditions. The Forest Service now makes the final surveys for patents free of charge to homesteaders within the forest reserves, thus saving them from $100 to $200 for each survey so made. This feature of the work

was begun during the summer of 1914. Nine patent surveys have been made this season. The total number of timber sales made on the Tongass and Chugach National Forests during the fiscal year was 305. All persons living on or near the national forests of Alaska are permitted to take free of charge all wood they need for their own domestic purposes. Timber needed by prospectors in the actual development of their claims prior to reaching the shipping stage, is given free of charge. A considerable area of lands within the Chugach Reserve was recently eliminated by Executive order. Forest fires in the Chugach Reserve and in interior Alaska during the past summer caused considerable damage to standing timber, and efforts should be made to minimize the fire danger during the dry months of the summer season by the maintenance of efficient fire patrols.

Water power.—The utilization of the water power of Alaska is of far-reaching import to the people of the Territory and also of the Nation. The Pacific coast of Alaska has many undeveloped water-power sites, many of them ideal in location and with few natural obstacles in the way to make them readily available by a comparatively moderate outlay of capital. This water power makes possible the development of the vast low-grade quartz deposits of southeastern Alaska. But few of Alaska's streams have been harnessed for power purposes, although one large project has been completed and another is in course of development. The forests of southeastern and southwestern Alaska, and especially the former, contain vast areas of timber suitable only for the manufacture of wood pulp. The forest is a virgin one, and millions of feet of timber are annually going to waste because the wood-pulp manufacturers under the conditions caused by uncertainty of title, multiplicity of red tape, and the profusion of regulations and restrictions that have existed have been scared out of the Territory. The importance of the bill now pending in Congress, as applied to industrial development in Alaska, can not be overestimated. As soon as some definite assurance of title for a term of years, coupled with reasonable regulations, can be obtained more of these water-power sites will be developed and the power utilized in the manufacture of wood pulp and electrochemical products.

Secretary of the Territory.—The offices of surveyor general and secretary of Alaska have been combined ever since the creation of the latter office by Congress, although no provision for its maintenance has ever been made. These offices should be segregated and an annual appropriation made for the proper maintenance of the office of secretary of Alaska. The work attached to the office has steadily increased in recent years. The Territorial legislature at its session this year created the office of attorney general for Alaska and also

the office of assistant superintendent of public instruction, both of which were made elective.

Buildings.—In 1910 Congress authorized the erection of a public building at Juneau, to cost, with site, $200,000. An excellent site was purchased costing $22,500. Since that time the town of Juneau has been growing rapidly, and the population of southeastern Alaska, where the capitol is located, has increased and is increasing in a substantial manner. Therefore an additional appropriation for a building should be made. This appropriation should not be less than $350,000 in addition to the sum already available. The building should be large enough for the housing of the various Federal offices located in Juneau—eight in number—the Territorial legislature, and the Historical Library and Museum.

Coal areas.—Surveys of the coal areas in Alaska, in the Bering River, Matanuska, and Nenana regions, together with classifications of the coal lands and reconnoissances of certain areas for reservation for the use of the Government, as provided by act of Congress, were begun during the past summer. Tests of the Matanuska coal for steaming purposes were made during the year under the direction of the Navy Department, and the coal was found eminently satisfactory. The coal now consumed in the Territory continues to be imported, a considerable portion of which comes from British Columbia. A decrease in the consumption of coal is noted, due to the greatly increased use of fuel oil in the Territory. Three patents of coal lands were issued during the fiscal year. The importation of coal into Alaska from the States and from foreign countries during the last fiscal year amounted to 79,239 tons, valued at $397,290. Of this 32,927 tons, valued at $141,480, was foreign coal, and 46,312 tons domestic, valued at $255,810.

Minerals.—The value of gold production of Alaska for the calendar year 1914 was $15,764,259, an increase of about $140,000 over that of the previous year. In 1914, 21,450,628 pounds of copper were produced in Alaska, as compared with 21,659,958 pounds in 1913. The value of Alaska's total mineral production for 1914 was $19,118,080; that of 1913 was valued at $19,476,356. This decrease was due to the low price of copper in 1914. It is estimated that up to the close of 1914 Alaska's production of minerals totaled in value $268,150,000, of which $244,156,000 represents the value of the gold output. For the present year the mineral production of Alaska will show a large gain over the previous year, due principally to the greatly increased production of copper in the Copper River district, southeastern Alaska; an increase in gold production will also be shown both from placer and lode sources. Generally speaking, the past summer has been favorable for placer mining operations. The

water supply has been abundant in most districts and considerable new ground has been worked this year. New discoveries have been reported in the Tolovana district, on Wild River, in the Koyukuk and Kuskokwin River regions. The older placer mines of the Territory continue to yield considerable quantities of gold, although the output is much less than the years immediately following their discovery. In copper production Alaska is steadily forging to the front; the output of this metal alone for the present calendar year, it is estimated, will reach in value $20,000,000. The low-grade placer deposits are very extensive in interior and northwestern Alaska, the development of which awaits cheaper transportation facilities and cheaper power. Mining began in Alaska in 1880, and since that time the Territory has produced $244,156,000 in gold, $19,800,000 in copper, $2,251,000 in silver, $370,000 in coal, and the rest in tin, lead, quicksilver, marble, gypsum, petroleum, etc. Copper mining began in Alaska in 1901, and the total production is about 133,000,000 pounds. The certainty of railroad communication with the Yukon Basin has greatly stimulated prospecting, mining, and agricultural development. There is a noticeable increase in investigations by large mining enterprises, as compared with previous years, and this is solely due to the expectation of cheaper transportation. Lode mining in southeastern Alaska, where several large mines are now in operation, is annually attaining greater proportions, due to the success that has been achieved in the treatment of low-grade ores, such as are found in this section. For the first time in the history of Alaska antimony in commercial quantities has been shipped during the present season from interior and northwestern Alaska. The total production of Alaska tin mines since the industry started in 1902 is about 550 tons of metallic tin, valued at $380,006. Two copper mines and five lode mines were operated in the Prince William Sound region in 1914. This number has been increased during the present year, and the output of both copper and gold will greatly exceed the output of the previous year. It is estimated that 125 placer mines, employing 1,200 men, were operated in the Fairbanks district during the summer of 1914. Thirty-nine gold dredges were operated on Seward Peninsula for the whole or part of the open season of 1914. A similar number has been operated the present year. About 1,200 men were engaged in mining on the peninsula in 1915, of which 450 were employed on the dredges. A number of locations of potential iron mines were made in 1914 about 25 miles northwest of Nome, but at only one locality is a considerable body of iron ore apparent. The prospecting work done so far shows only the area of the deposit and not its depth.

The office of the governor of Alaska would have been literally swamped with work for the past two years had it not been for the

action of the territorial legislature in making an annual appropriation for clerk hire in that office, Congress having failed to do so, although yearly requests have been made for additional clerical and stenographic assistance.

HAWAII.

The governor of Hawaii in his annual report stated that the year ending June 30, 1915, has been one of unusual prosperity in the main industry of the islands, sugar growing, not only in the increase in quantity produced but in financial returns. Their second exportable staple, canned pineapples, increased in production and gross value, but individual growers of pines suffered greatly from the collapse of prices to a point below cost. Other products are limited and no exceptional changes took place. How generally the notable prosperity of the Territory has been diffused can hardly be calculated. Evidence of general prosperity appears in the improvements throughout the Territory, particularly in the great number of attractive, artistic, unpretentious homes being erected. No discontent among labor has been apparent. The legislature, session of 1915, has made reasonable appropriations that will increase employment and provide for many necessary improvements.

Imports and exports.—The imports for the fiscal year amounted to $26,064,855, a decrease, as compared with the previous year, of $9,485,402. The exports amounted to $62,338,356, the exports of sugar amounting to $19,758,187, and of pineapples to $1,257,604, and the increase over the preceding year being $20,774,284.

Customs and internal-revenue receipts.—Customs receipts for the fiscal year totaled $1,019,534.68, a falling off of $164,881.49. Internal-revenue receipts yielded $419.057.39, an increase over the previous year of $186,082.96.

Receipts and disbursements.—The Territory still collects and pays over to the city and county of Honolulu and the counties the greater part of their revenues, and in turn receives back from them the cost of assessing and collecting taxes and the interest and sinking fund on bonds issued by the Territory for the benefit of the counties.

Territorial finances.—The assessment of property increased $15,413,996 over the year 1914 making a total of $176,601,222. This illustrates the working of the Hawaiian law, making certain taxable valuations subject to their basis as enterprises for profit. Nineteen hundred and twelve was a prosperous year and valuations totaled $176,834,801; 1914 was less prosperous and valuations fell to $161,187,226; while 1915 shows the rise again. The total revenues collected by the Territory and counties aggregated $4,691,831.81, an increase of $380,100.41 over the year 1914. Of the above income

$2,557,675.73 was by law set aside for the county governments and $2,134,156.08 remained for Territorial expenditure. Out of the $3,162,148.16 available for the Territory from current revenues, including cash on hand, $2,747,270.35 was expended, leaving a net cash balance on hand at the close of the year of $414,877.81. The bonded indebtedness of the Territory was increased during the year by the sale of $1,179,500 of 4 per cent public improvement bonds of the issue of 1914 at 100.01 and decreased by the payment of $150,000 of the 1903 issue of 4½ per cent public-improvement bonds, leaving a bonded indebtedness of $7,873,500 at the close of the year.

Bank deposits.—Bank deposits at the close of the calendar year were $20,114,610.85, of which $7,736,569.32 were savings deposits. The increase of commercial deposits was $2,006,166.93 and of savings $1,460,778.69.

Corporations.—During the fiscal year 25 mercantile, 4 agricultural, 2 savings and loan, 1 insurance, and 8 eleemosynary corporations—40 in all—were created; and 8 mercantile, 2 agricultural, and 1 eleemosynary corporations were dissolved—11 in all—leaving at the close of the year 935 domestic corporations—an increase of 29. The total capitalization of domestic corporations other than eleemosynary, etc., is $175,086,293, a decrease of $543,400, or 0.3 per cent for the year. Foreign corporations to the number of 152, as compared with 149 the preceding year, are authorized to do business in the Territory. Five national banks also do business in the Territory. Prior to the 1915 session of the legislature there was nothing that could be done to wipe defunct corporations off the books. Act 57, laws of 1915, gives the treasurer this authority and he is actively engaged in this work. The corporations that are positively known to be dead are capitalized at $22,637,900.

Population and its problems.—The estimated population June 30, 1915, was 223,256 civilians, 9,600 Army and Navy, total 232,856. Orientals predominate, totaling 136,626. In births orientals predominate far in excess of the average. Native full-blood Hawaiians continue to decrease. The total number of births during the year was 8,507, an increase of 1,751 over the number for the previous year, showing a birth rate of 36.52 per thousand, estimating the population at 232,856. The total number of deaths from all causes was 3,556, a decrease of 151 from the previous year, showing a death rate of 15.03 per thousand on the same estimated population. The marriages number 2,730, a decrease of 419.

Public health.—The Territorial department of public health does most of the public-health work, although some is done by the local governments, and much assistance is given by various corporations, organizations, and individuals, financially and in other ways. The officials of the United States Public Health Service and the Terri-

torial health officers work in cooperation. The general health conditions in the Treasury are best reflected by the morbidity and mortality reports. An analysis of these shows that health conditions have been better than during 1913–14, and that they compare favorably with other States in the Union. At the last session of the legislature a number of new laws on the subject of public health were passed and some amended. Provision was made for the care, control, and treatment of persons addicted to the excessive use of drugs or liquor, and increased accommodation for insane persons of the acute and curable class; for the appointment of a commission to compile the sanitary code of the Territory; and for the transportation of females to the insane asylum. The sections of the revised laws relating to pure food and abatement of nuisances and insanitary lands and to the sale of opium were amended so that the methods of procedure would be more effective, as was also the law relating to the recording of births.

Public lands.—No notable features have occurred during the past year. There has been normal homesteading, but no areas of moment have by expiration of leases been returned to Government control. Much attention is being paid to preparation for action upon expiration of leases covering public lands. During the year 176 homesteads, covering an area of 2,348.58 acres, valued at $37,635.55, were taken up. Since the amendments made in the organic act five years ago 2,603 homestead lots have been offered, covering 67,612.14 acres, at valuations aggregating $666,773.38. During the 15 years of Territorial government 2,926 homesteads have been taken, of which 931, or an average of 133 a year, were taken the first 7 years, and 1,995, or an average of 249 a year, during the last 8 years.

Agriculture.—In 1908 the United States Reclamation Service reported that the maximum of cultivable land in the Territory was about 400,000 acres. While this limit has not yet been reached, it has been closely approached. Much time has been devoted to the breeding and distribution of parasites for the Mediterranean fruit fly and horn fly, and large numbers of these parasites have been liberated throughout the islands. Much information regarding the control of certain pests and diseases of plants and vegetables has been given.

Forest reserves.—Forest reserves should be established on the island of Oahu and some authority secured from the Congress of the United States to add to the area from private ownership.

Public works.—Public works are being energetically forwarded and cover quite a range of objects, particularly that of wharves and water-front improvements. Nearly every island port has had attention, and the coming year should show completion of most projects

not in conjunction with those of the Federal Government. The construction of a modern prison has been commenced during the year and is well under way on a site covering 9,816 acres in area in a suburban district of Honolulu. The sum of $150,000 was appropriated out of loan funds for this purpose. Expenditures during the year amounted to $30,842.28, leaving a balance of $119,157.72 unexpended.

Honolulu Harbor enlargement.—Plans for material enlargement have been made, but await the necessary appropriations. The board of harbor commissioners is entering on extensive wharf improvements at Honolulu and are completing the few requirements of the other island ports.

Education.—The number of school children increased during the year by 3,241, making a total of 36,529, and it is estimated that at the opening of schools September 13, 1915, the enrollment will be 37,729 pupils. The school accommodations under the bungalow system of buildings, so adapted to the climate and financial resources, are rapidly supplying the demand for room for the marked increase of pupils. With a lack of skilled employment, the question of occupation for the educated youth presents quite a problem. The only sensible solution has seemed to be to encourage to a greater degree education that will not result largely in dependence upon mental rather than physical employment. The course of study as adopted has the above in view, although every facility and opportunity is provided for those mentally equipped, ambitious, and able, that they may acquire higher education.

With his report the governor submits charts containing compilations of data under the following titles: Public lands of the Territory of Hawaii, population, Territory of Hawaii, percentages of increase or decrease of population by nationalities, comparative (as to nationalities) table of births, educational problems, food problems, problems of business by races.

NATIONAL PARKS AND RESERVATIONS.

The creation of the Yellowstone National Park in Wyoming, Montana, and Idaho by the act of March 1, 1872, marked the beginning of a policy on the part of Congress of setting aside tracts of land as recreation grounds for all the people. Since that time 12 additional national parks have been established in various sections of the country, the latest being the Rocky Mountain National Park, in Colorado, which park was opened to the public last June. The total amount of land embraced in these reservations is 4,665,966.25 acres. To these parks should be added as speedily as possible the Grand Canyon of the Colorado River, with its wonderful scenic features. The areas of these

national parks, with the date of the establishment of each, are as follows:

Area of national parks.

Name.	Date of establishment.	Area.
		Acres.
Yellowstone, in Wyoming, Montana, and Idaho	Mar. 1, 1872	2,142,720
Yosemite, in California	Oct. 1, 1890	719,622
Sequoia, in California	Sept. 25, 1890	161,597
General Grant, in California	Oct. 1, 1890	2,536
Mount Rainier, in Washington	Mar. 2, 1899	207,360
Crater Lake, in Oregon	May 22, 1902	159,360
Wind Cave, in South Dakota	Jan. 9, 1903	10,522
Sullys Hill, in North Dakota	Apr. 27, 1904	780
Platt, in Oklahoma	July 1, 1902 Apr. 21, 1904	848.22
Mesa Verde, in Colorado	June 29, 1906 June 30, 1913	48,966.40
Glacier, in Montana	May 11, 1910	981,681
Rocky Mountain, in Colorado	Jan. 26, 1915	229,062
Hot Springs Reservation, in Arkansas	June 16, 1880	911.63
Total		4,665,966.25

Visitors.—The interest of the general public in these national parks has been clearly evidenced by the large number of requests for literature regarding them. During the season just closed there has been very marked increases in the number of tourists visiting these national playgrounds. In the Yellowstone National Park in 1914 there were 20,250 visitors, and this year two and one-half times as many—51,895. Yosemite National Park in California had 33,452 visitors during the 1915 season, whereas in 1914 only 15,145 persons visited the park. Again, in Mount Rainier National Park, Wash., there has been an increase in the number of visitors of over 100 per cent—35,166 in 1915 as against 15,038 in 1914. The following table strikingly indicates how greatly popular interest in national parks has increased.

Tourist travel in national parks.

	1914	1915
Yellowstone National Park (Wyo.)	20,250	51,895
Yosemite National Park (Cal.)	15,145	33,452
Sequoia National Park (Cal.)	4,667	7,647
General Grant National Park (Cal.)	3,735	10,523
Mount Rainier National Park (Wash.)	15,038	35,166
Mesa Verde National Park (Colo.)	502	663
Crater Lake National Park (Oreg.)	7,096	11,371
Glacier National Park (Mont.)	14,168	14,265
Rocky Mountain National Park (Colo.)	.....	31,000
Wind Cave National Park (N. Dak.)	3,592	2,817
Platt National Park (Okla.)	30,000	20,000
Sully's Hill National Park (S. Dak.)	500	1,000
Hot Springs Reservation (Ark.)	125,000	115,000
Total	239,693	334,799

Economic value of national parks.—Leaving out of consideration the cost to visitors of transportation from their homes to the parks, a fair idea of the economic value of tourist travel in four of the larger

parks may be obtained by consideration of the financial reports of concessioners, which show gross receipts for past seasons in the following approximate estimates: Yellowstone National Park, in 1912, $1,067,161.34; in 1913, $1,186,811.36; and in 1914, $848,688.44. Yosemite National Park, in 1912, $311,444.32; in 1913, $359,481.45; and in 1914, $334,914.32. Glacier National Park, in 1913, $161,510.87, and in 1914, $155,716.14. Mount Rainier National Park, in 1912, $56,735.93; in 1913, $66,942.76; and in 1914, $61,078.08.

Financial reports of concessioners in the parks for the season of 1915 have not yet been received in the department, but in view of the large tourist travel to the far West initiated by the expositions held in California, it is anticipated that marked increases in gross receipts by national-park concessioners will be noted.

Third national-park conference.—In prior annual reports attention has been directed to the very satisfactory results obtained from bringing together in conference the various park superintendents for the purpose of discussing the many difficult problems presented in the administration of these reservations. In March of the present year the third conference of superintendents was held at Berkeley, Cal., under the immediate direction of the assistant to the secretary, at which there were in attendance other representatives of this department, representatives of the Departments of Agriculture and War, of the transcontinental railways, of many of the concessioners in the parks, as well as a number of other persons interested in national-park matters. Questions were discussed pertaining to hotel accommodations, sanitation, transportation, construction of roads, trails, and bridges, forestry, fire protection, protection of game, and other phases of park administration. A detailed report of the conference will be published by the department.

The concensus of opinion at this conference as well as of those conferences held in 1911 and 1912, was that as many of the problems of park management were substantially the same throughout the several national parks, their supervision should be centralized or grouped together under a single administrative bureau specifically charged with such work. The conference developed many instances where economy and efficiency would be increased by a central administration of all the parks. For instance, the law does not permit the resident engineer of the Yosemite to be utilized at times in any other national park. A temporary surplusage of service or equipment can not be used to meet a corresponding need elsewhere. Without a central administration the national parks can not be handled together, like departments of one business, for the good of all.

Bills to create a national-park service have heretofore been introduced in Congress, but none has as yet been enacted into law.

Appropriations and revenues.—The total of appropriations made by Congress for protection and improvement of these parks during the year, expendable under this department, was $283,590, and the total revenues received from concessions in all the parks was $81,705.70.

Expenditures of revenues.—The several acts of Congress setting aside lands for national-park purposes, except in case of the Crater Lake National Park, Oreg., and the Mesa Verde and Rocky Mountain National Parks, Colo., authorize the expenditure of the revenues derived from the privileges or concessions therein in the management and protection of the respective reservations. The revenues from the three parks above mentioned, however, are under existing law deposited in the Treasury to the credit of miscellaneous receipts, and the parks receive no direct benefit therefrom. It is desirable that these parks, so far as their revenues are concerned, be put upon the same footing as the other national parks.

Automobiles in the parks.—Automobiles have heretofore been admitted under strict regulations governing travel of the roads to the Mount Rainier, Crater Lake, Glacier, Mesa Verde, General Grant, Platt, and Wind Cave national parks; over the Giant Forest Road, in Sequoia National Park; in Yosemite National Park, over the Coulterville Road from the Merced Grove of Big Trees into Yosemite Valley, over the Wawona Road leading to the Mariposa Big Tree Grove, and over the Big Oak Flat Road; and in the Yellowstone National Park, over a road in the northwestern section of the park not in general use, for the special accommodation of people of Gallatin County, Mont.

During the past season the generally traveled roads in Yellowstone National Park were opened to motor-driven vehicles, operated for pleasure purposes only, under strict regulations which became effective on August 1, 1915.

The roads in Hot Springs Reservation are not in such condition, considering the safety of individuals and animals, as to permit of their joint use by motor-driven vehicles and vehicles drawn by horses, but on special occasions and under special restrictions motor-driven vehicles are permitted on such roads.

The opening during the year of Yellowstone National Park to automobiles used for pleasure purposes has been much appreciated by the traveling public. They were operated under a very carefully worked out schedule which has proved to be highly satisfactory.

This park was visited during the season by 958 cars, carrying 3,513 people, which points to a much fuller enjoyment of the wonders in this park by motorists in 1916. The total receipts from automobiles and motor cycles in all the parks were $42,589.73 in 1915 as against

$14,243.07 in 1914. Automobile licenses have been issued during 1915, as follows:

Automobile licenses issued seasons of 1914 and 1915.

National park.	1914		1915	
	Automobiles.	Motor cycles.	Automobiles.	Motor cycles.
Mount Rainier	1,594	188	3,238	247
Crater Lake	1,107	18	2,015	31
Glacier	267	4	457	26
Sequoia	158	.....	330	11
General Grant	392	12	1,584	40
Yosemite	673	.....	3,895	.....
Wind Cave	11	.....	10	.....
Mesa Verde	34	4	86	.....
Yellowstone	.....	.....	958	.....
Platt	.....	.....	6	.....
Total	4,236	226	12,579	355

The extremely rapid development of motoring throughout the country, and its enjoyment by people of all degrees of income, has led to an active policy of road extension in all the national parks. An example is the acquisition and improvement of the old Tioga Road through the Yosemite National Park, establishing another highway over the Sierras.

Private holdings.—The administration of affairs in all of the national parks, with the exception of the Yellowstone, General Grant, Platt, Wind Cave, and Sullys Hill, is considerably embarrassed by the fact that within the respective boundaries are many patented lands and some toll roads. These private holdings are as follows: Yosemite National Park, 19,827 acres; Sequoia National Park, 3,716.96 acres; Crater Lake National Park, 1,337 acres and 1,121.11 acres of unperfected claims; Mesa Verde National Park, 875 acres and 118 acres unperfected claims; Mount Rainier National Park, 18.2 acres; and Glacier National Park, 8,864.40 acres of patented lands and 7,803.71 acres of unperfected claims.

The majority of these lands, including the Mineral King Road in Sequoia National Park and the Coulterville and Wawona toll roads in Yosemite National Park should be acquired by the Government. During the year, through the instrumentality of Mr. Stephen T. Mather, assistant to the Secretary, the title by donation to portions of the "Great Sierra wagon and toll road" (also known as the Tioga Road) and the portions of the "Big Oak Flat and Yosemite Toll roads," within the limits of Yosemite National Park, were transferred to the United States, such donations being accepted by the Secretary of the Interior under the provisions of the sundry civil act of March 3, 1915, authorizing the Secretary of the Interior to accept patented lands or rights of way, whether over patented or other lands, in

Yosemite National Park that may be donated for park purposes. In discussing the matter of acquisition of private holdings in the parks in a prior annual report, the Secretary of the Interior stated:

> It is of special and urgent importance that provision should also be made by Congress for the extinguishment of private holdings in the several parks. These holdings seriously interfere with the proper administration of the parks and impair their usefulness and beauty in many ways. They can be extinguished either by way of direct appropriation for their purchase or by authorizing their exchange for lands or timber within the particular parks or within the national forest reserve adjacent thereto. The public timber so exchanged can, in many cases, be confined to dead, or matured timber which can be removed from the parks without injuriously affecting the scenic beauty thereof. If authority of this sort is vested in the Secretary of Agriculture and the Secretary of the Interior, as to the reserves of which they have jurisdiction, respectively, exchanges of park or forest lands or timber can be made for appropriate strips of private timbered lands along the public roads within the exterior limits of the parks or forest reserves, so as to protect the scenic beauty of these roads from impending destruction.

Thereafter Congress, by the act approved April 9, 1912 (37 Stat., 80), authorized the Secretary of the Interior, for the purpose of eliminating private holdings within the Yosemite National Park and to preserve intact the natural timber along the roads in the scenic portions of the park, both on patented and park lands, in his discretion, to obtain by exchange complete title to any and all of the lands within the boundaries of the park held in private ownership. Among other things it was provided that the value of patented lands within the park offered in the exchange and the value of timber on park lands proposed to be given in the exchange should be ascertained in such manner as the Secretary of the Interior might direct.

The subject was taken up with the Yosemite Lumber Co., which has a large area of patented lands in the park, principally along the Wawona Road, and it was found that an exchange could not be made, for the reason that the value of the lands owned by the company with the timber thereon was far in excess of the timber on the park lands, and Congress, by the act approved April 16, 1914 (38 Stat., 345), amended section 1 of the act of 1912 so as to authorize the Secretaries of the Interior and Agriculture, for the purpose of eliminating private holdings in said park and perserving the timber along the roads adjoining the scenic portions thereof on patented lands, to obtain and accept for the United States a complete title to any and all patented lands within the boundaries of the park "by the exchange of timber or timber and lands within the Yosemite National Park and the Sierra and Stanislaus National Forests for such lands and the timber thereon within the park."

Under this legislation the matter was taken up with the Yosemite Lumber Co., and a contract was entered into on January 18, 1915, between it and the department under which the Government is to give timber and timber lands in Yosemite National Park and Sierra

National Forest to that corporation in exchange for lands and timber owned by it in the park and forest, the exchange values in each case to be equal. This contract is now being carried into effect under supervision of the representatives of the department in the park.

The act of Congress approved May 13, 1914 (38 Stat., 376), for the purpose of preserving scenic features and consolidating certain forest lands belonging to the United States within the Sierra National Forest and the Yosemite National Park, Cal., authorizes the Secretary of the Interior, on the recommendation of the Secretary of Agriculture—

and after obtaining and accepting for the Government of the United States a valid title to the land to be acquired, which title shall be approved by the Secretary of the Interior, to exchange lands belonging to the United States within the Sierra National Forest for privately owned timberlands of approximately equal area lying within the boundaries of said national forest and the Yosemite National Park.

Under this statute an exchange of lands has been consummated which will result in the addition of 160 acres of land to the park.

Senate bill 5433, which passed the Senate on June 5, 1914, authorized the Secretary, for the purpose of eliminating private holdings within the Glacier National Park, and to preserve the natural timber along the roads in the scenic portions of the park on patented and park lands, to obtain for the United States a complete title to any or all lands held in private or State ownership within the park "by the exchange of dead, decadent, or matured timber that can be removed from any part of the park without affecting the scenic beauty thereof, or from Government lands within the metes and bounds of the national forests within the State of Montana," and also to exchange for patented lands in the park Government lands of equal value within national forests in said State, the lands in the national forests to be offered in exchange to be determined by the Secretary of Agriculture. This bill, however, failed to become a law.

Jurisdiction.—The United States has exclusive jurisdiction over the lands in Yellowstone Park within the State of Wyoming and also over the lands within Glacier National Park, Mont., and Platt National Park, Okla., and Congress has provided a means of enforcement of the laws and regulations pertaining thereto. In the other national parks, however, over which the laws of the States in which they are located obtain, great difficulties in administration have been encountered, owing to the fact that the department has no jurisdiction to punish offenses in violation of the regulations relating thereto, and especially in the matter of preventing depredations on game and the selling of liquor therein.

Conservation of wild animal life.—The national parks, free as most of them are from all public lumbering and private grazing enterprises, and protected by law from hunting of any kind, alone have the

seclusion and other conditions essential for the protection and propagation of wild animal life. Eventually they will become great public nature schools to which teachers and students of animal life will repair yearly for investigation and study.

The enormous increase of wild animals in the Yellowstone since it became a national park in 1872 points the way. Deer, elk, moose, bison, and antelope here abound in greater numbers no doubt than before the days of the white man; and many of them have become almost as fearless of man as animals in captivity. From here many State, county, and city parks have been supplied, under proper restrictions, with surplus animals for propagation purposes. When interfering private holdings are extinguished in other national parks and United States laws made to supersede State laws, these, too, will become centers of animal preservation as effective as the Yellowstone.

Increasing park areas.—Congress so carefully cut the boundaries of the national parks to the express purpose for which each was created that, in some instances, scenic features of the very first order were excluded. In the careful study which the department has since made of each such territory it has become apparent that, in several instances, outlying territory should be added to these reservations. The most distinguished of these instances is Sequoia National Park, the boundaries of which should be extended to include the superb Kings Canyon on the north and on the east the Kern Canyon and the west slope and summit of Mount Whitney, the highest mountain under the American flag; also other instances are the Continental Divide for a few miles south of the new Rocky Mountain National Park, together with several small outlying features of extraordinary beauty.

New national parks.—Of the 10 or more scenic neighborhoods claiming national-park status the most distinguished is the Grand Canyon of the Colorado, now classed as a national monument. This is one of the greatest natural show places of the world. It demands and should have immediate recognition and development as a national park.

Other proposed national parks have scenic value and availability of high degree and will be considered as they come prominently before Congress through the desires and activities of the people of their respective States. It is the policy of the department not to actively seek the creation of new national parks but to develop and administer all such reservations accepted by Congress and intrusted to its care.

General superintendent of national parks.—Mr. Mark Daniels, general superintendent and landscape engineer of the national parks under this department, made inspections during the year of the

Mesa Verde, Platt, and Wind Cave national parks and the Hot Springs Reservation; supervised the enforcement of the regulations in the parks, the laying out of roads and trails, designing of buildings and structures, and the planning of general improvements; provided for the establishment of a unit cost-keeping system in the Yosemite National Park which has resulted in considerable saving, supervised the construction of a concrete bridge in the Mount Rainier National Park, and wooden bridges in the Yosemite National Park, and supplied plans and specifications for several different types of concrete bridges for other parks; replanned the road sprinkling system in Yosemite, established an automobile schedule therein, designed a complete road and trail system for five of the parks, prepared plans for a new village in Yosemite, installed a purchasing branch for the several national parks in San Francisco and purchased through the same materials for most of the western parks, and gave attention to many other details of park administration.

Proposed national park service.—In the annual report of the Secretary of the Interior for 1911, in discussing national-park affairs, he stated:

> While public interest in and use of these reservations is steadily increasing, as shown by the growing number of visitors, adequate provision has not been made for their efficient administration, and sufficient appropriations have not been made for their proper care and development. At present each of these parks is a separate and distinct unit for administrative purposes. The only general supervision which is possible is that obtained by referring matters relating to the national parks to the same officials in the office of the Secretary of the Interior. Separate appropriations are made for each park, and the employment of a common supervising and directing force is impossible. Many of the problems in park management are the same throughout all of the national parks, and a great gain would be obtained and substantial economies could be effected if the national parks and reservations were grouped together under a single administrative bureau. Bills to create a bureau of national parks have heretofore been introduced in Congress, and, in my judgment, they should immediately receive careful consideration, so that proper legislation for this purpose may be enacted. Adequate appropriation should also be made for the development of these pleasure grounds of the people, especially through the construction of roads and trails and their proper care and maintenance.

In a special message to Congress, dated February 3, 1911, President Taft stated:

> I earnestly recommend the establishment of a bureau of national parks. Such legislation is essential to the proper management of those wondrous manifestations of nature, so startling and so beautiful that every one recognizes the obligations of the Government to preserve them for the edification and recreation of the people.

A bill (S. 826, 63d Cong., 1st sess.) to establish the national park service, and for other purposes, was reported favorably from the Senate Committee on Public Lands, but failed to become a law.

There are hereto appended tables giving the location, date of establishment, area, private holdings, if any, and number of visitors,

and the special characteristics of the various national parks under the supervision of the Secretary of the Interior, the appropriations made by Congress for the protection and improvement thereof during 1915 and nine years prior thereto, as well as revenues derived from leases, privileges, and concessions in said reservations received during said period; also a statement of the automobile receipts during 1915.

NATIONAL MONUMENTS AND PRESERVATION OF AMERICAN ANTIQUITIES.

By an act approved June 8, 1906, entitled "An act for the preservation of American antiquities," the President of the United States is authorized, "in his discretion, to declare by public proclamation historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest that are situated upon the lands owned or controlled by the Government of the United States to be national monuments." Under such authority the President has created 30 monuments:

National monuments administered by Interior Department.

Name.	State.	Date.	Area.
			Acres.
Devils Tower	Wyoming	Sept. 24, 1906	1,152
Montezuma Castle	Arizona	Dec. 8, 1906	160
El Morro	New Mexico	....do....	160
Chaco Canyon	....do....	Mar. 11, 1907	[1] 20,629
Muir Woods [2]	California	Jan. 9, 1908	295
Pinnacles	....do....	Jan. 16, 1908	2,080
Tumacacori	Arizona	Sept. 15, 1908	10
Mukuntuweap	Utah	July 31, 1909	[1] 15,840
Shoshone Cavern	Wyoming	Sept. 21, 1909	210
Natural Bridges [3]	Utah	Sept. 25, 1909	[1] 2,740
Gran Quivira	New Mexico	Nov. 1, 1909	160
Sitka	Alaska	Mar. 23, 1910	57
Rainbow Bridge [4]	Utah	May 30, 1910	160
Lewis and Clark Cavern	Montana	May 16, 1911	160
Colorado	Colorado	May 24, 1911	13,883
Petrified Forest	Arizona	July 31, 1911	25,625
Navajo [4]	....do....	Mar. 14, 1912	360
Papago Saguaro	....do....	Jan. 31, 1914	2,050
Dinosaur	Utah	Oct. 4, 1915	80

[1] Estimated area.
[2] Donated to the United States.
[3] Originally set aside by proclamation of Apr. 16, 1908, and contained only 120 acres.
[4] Within an Indian reservation.

Administrative conditions.—The supervision of these various monuments has, in the absence of any specific appropriation for their protection and improvement, necessarily been intrusted to the field officers of the department having charge of the territory in which the several monuments are located.

As stated in the last annual report, the administrative conditions continue to be unsatisfactory, since no appropriation of funds has yet been made available for this important, protective, and preservative work. Such supervision as has been possible in the cases of a few monuments only has been wholly inadequate and has not pre-

vented vandalism, unauthorized exploitation, or spoliation of relics found in those prehistoric ruins, whose preservation is contemplated by the passage of the act of June 8, 1906. An estimate in the sum of $5,000 for protection of these monuments was submitted in 1913, but no appropriation was made by Congress. This amount was desired, not so much for the purpose of preserving by restoration the objects reserved in the national monuments as to prevent the removal of valuable relics and vandalism. Monuments suffering from these causes should be provided with a custodian or superintendent, and in this way a small general appropriation can be made most useful and its expenditure will be wholly in the interest of the public. The protection and preservation of the national monuments as public reservations are of great interest and importance, because a great variety of objects, historic, prehistoric, and scientific in character, are thus preserved for public use intact, instead of being exploited by private individuals for gain and their treasures scattered. These reserves should be administered in connection with the national parks, which they strongly resemble. It would be difficult to define one in terms that would exclude the other. The renewal of the estimate for an appropriation of $5,000 has been made for the purpose of keeping this class of reserves intact until such time as Congress shall authorize the creation of some administrative unit which shall take over both the parks and monuments and administer them under a general appropriation. No new monuments were created during the year.

National monuments under other departments.—The following national monuments are not administered by the Secretary of the Interior:

National monuments administered by Department of Agriculture.

Name.	State.	Date.	Area.
			Acres.
Cinder Cone	California	May 6, 1907	[1] 5,120
Lassen Peak	do	do	[1] 1,280
Gila Cliff Dwellings	New Mexico	Nov. 16, 1907	160
Tonto	Arizona	Dec. 19, 1907	[1] 640
Grand Canyon	do	Jan. 11, 1908	[1] 806,400
Jewel Cave	South Dakota	Feb. 7, 1908	[1] 1,280
Wheeler	Colorado	Dec. 7, 1908	[1] 300
Oregon Caves	Oregon	July 12, 1909	480
Devil Postpile	California	July 6, 1911	[1] 800
Mount Olympus	Washington	Apr. 17, 1912	[1] 299,370

[1] Estimated area.

National monuments administered by War Department.

Name.	State.	Date.	Area.
			Acres.
Big Hole battle field [1]	Montana	June 23, 1910	5
Cabrillo	California	Oct. 14, 1913	1

[1] Set aside by Executive order.

Excavation of ruins.—Paragraph 3 of the uniform rules and regulations promulgated by the Secretaries of the Interior, Agriculture, and War, under date of December 28, 1906, to carry out the provisions of the act for the preservation of American antiquities, reads as follows:

> Permits for the excavation of ruins, the excavation of archæological sites, and the gathering of objects of antiquity will be granted by the respective Secretaries having jurisdiction to reputable museums, universities, colleges, or other recognized scientific or educational institutions, or to their duly authorized agents.

During the year seven permits were granted for the examination, excavation, and gathering of specimens, as follows:

To Prof. A. V. Kidder, of Harvard University, to make examination and excavation of ruins in the Chinlee Valley and the tributary canyons which enter it below the Mexican water and the canyons heading against the Navajo Mountains on its east and north sides, as continuation of explorations under similar permits granted by the department in 1913 and 1914. This locality is in the vicinity of the Navajo National Monument.

To Mr. Edgar L. Hewett, director of the School of American Archæology, Santa Fe, N. Mex., to make explorations and excavations necessary for the making of an archæological report upon the district lying between the north boundary of the Ramon Vigil grant and the Guages Canyon, on the Pajarito Plateau, N. Mex., and to collect specimens for the use of the Commercial Museum of Philadelphia, Pa., which institution collaborates with the School of American Archæology in this research work.

To the Smithsonian Institution, to make archæological reconnoissance of and, if deemed practicable, to conduct excavations and gather specimens on the public domain in Millard, Beaver, Iron, and Box Elder Counties, Utah, such collections to be permanently deposited in the United States National Museum.

To Prof. Livingston Farrand, president of the University of Colorado, to prosecute archaeological research on public lands under administration of the Interior Department in San Juan and Rio Arraba Counties, N. Mex., and in a strip of country 15 miles in width crossing Montezuma, La Plata, and Archuleta Counties (not, however, within the boundaries of the Mesa Verde National Park), and to collect specimens. This work is in the nature of continuation of research under similar permit issued in 1914 covering territory contiguous to the above.

To the University of Arizona, at Tucson, Ariz., to prosecute archaeological research within the territory south and west of Navajo Mountain and in the Sagi Canyons, in northern Arizona east of the Colorado River, and to collect specimens for use of the university, such work to be conducted under personal supervision

of Prof. Byron Cummings (formerly of the University of Utah), and the territory within which explorations take place not to overlap that covered by the above permit to Prof. Kidder.

To Mr. Charles H. Robinson, to gather archaeological specimens on the public domain within the so-called "Spanish Diggings" country, located east of the Platte River, in Converse, Niobrara, Platte, and Goshen Counties, Wyo., during August, 1915, such collections to be permanently deposited, one-half in the McLean County (Ill.) Historical Society Museum, Bloomington, Ill., and one-half in the Illinois State Natural Historical Museum at Springfield, Ill.

To Dr. R. B. Earle, to collect not exceeding 100 pounds of specimens of silicified wood from the Fossil Forest of Arizona (Petrified Forest National Monument) for the museum of New York University, and similar quantity for the museum of Hunter College.

Bird reserves.—All of the bird reserves have been created through reference from the Interior Department to the President of forms of Executive orders providing therefor. These reserves are regarded as in all essential particulars reservations of public lands for public use or other purposes, for which there are numerous precedents. The first specific act of Congress providing for the protection of birds by bird reserves created by Executive order was introduced by Hon. John F. Lacy, of Iowa, and became a law on June 28, 1906 (34 Stat., 536). This act made it unlawful to kill birds, to take their eggs, or to willfully disturb birds upon the reservations, and it provides a fine of not exceeding $500 or imprisonment for not exceeding six months, or both fine and imprisonment, for each conviction secured. This law was substantially reenacted in the new Penal Code, approved March 4, 1909 (35 Stat., 1104), in the following language:

SEC. 84. Whoever shall hunt, capture, willfully disturb, or kill any bird of any kind whatever, or take the eggs of any such bird, on any lands of the United States which have been set apart or reserved as breeding grounds for birds by any law, proclamation, or Executive order, except under such rules and regulations as the Secretary of Agriculture may from time to time prescribe, shall be fined not more than five hundred dollars or imprisoned not more than six months, or both.

During the year four new reservations for the protection of native birds were created, as follows:

Dungeness Spit and Ediz Hook, in Washington, created January 20, 1915.
Mille Lacs, in Minnesota, created May 14, 1915.
Big Lake, in Arkansas, created August 2, 1915.

One reservation, Blackbeard Island, in Georgia, was abolished on May 25, 1915.

The reservations now existing are 70 in number, of which 68 are being administered under the direction of the Biological Survey, Department of Agriculture. The Pribilof Reservation in Alaska is administered by the Bureau of Fisheries of the Department of Com-

merce, and the Canal Zone Reservation, Panama, by the Isthmian Canal Commission.

Bird reserves created.

Name of reservation.	Date.	Location.	Area.
Pelican Island	Mar. 14, 1903	East Florida coast	5.50 acres.
Breton Island	Oct. 4, 1904 Nov. 11, 1905	Southeast coast of Louisiana	Unknown.
Stump Lake	Mar. 9, 1905	North Dakota	27.39 acres.
Huron Islands	Oct. 10, 1905	Lake Superior, Mich.	Unknown.
Siskiwit Islands	do	do	Do.
Passage Key	do	Tampa Bay, Fla.	36.37 acres.
Indian Key	Feb. 10, 1906	do	90 acres.
Tern Islands	Aug. 8, 1907	Mouths of Mississippi River, La.	Unknown.
Shell Keys	Aug. 17, 1907	South Louisiana coast	Do.
Three Arch Rocks	Oct. 14, 1907	West Oregon coast	Do.
Flattery Rocks	Oct. 23, 1907	West Washington coast	Do.
Quillayute Needles	do	do	Do.
Copalis Rock	do	do	Do.
East Timbalier Island	Dec. 7, 1907	South Louisiana coast	Do.
Mosquito Inlet	Feb. 24, 1908	East Florida coast	Do.
Torgugas Keys	Apr. 6, 1908	Florida Keys, Fla.	Do.
Klamath Lake	Aug. 8, 1908	Oregon and California	Do.
Key West	do	Florida Keys, Fla.	Do.
Lake Malheur	Aug. 18, 1908	Oregon	Do.
Chase Lake	Aug. 28, 1908	North Dakota	Do.
Pine Island	Sept. 15, 1908	West Florida coast	Do.
Matlacha Pass	Sept. 26, 1908	do	Do.
Palma Sola	do	do	Do.
Island Bay	Oct. 23, 1908	Florida	Do.
Loch Katrine	Oct. 26, 1908	Wyoming	Do.
Hawaiian Islands	Feb. 3, 1909	Hawaii	Do.
East Park	Feb. 25, 1909	California	Do.
Cold Springs	do	Oregon	Do.
Shoshone	do	Wyoming	Do.
Pathfinder	do	do	Do.
Bellefourche	do	South Dakota	Do.
Strawberry Valley	do	Utah	Do.
Salt River	do	Arizona	Do.
Deer Flat	do	Idaho	Do.
Minidoka	do	do	Do.
Willow Creek	do	Montana	Do.
Carlsbad	do	New Mexico	Do.
Rio Grande	do	do	Do.
Keechelus Lake	do	Washington	Do.
Kachess Lake	do	do	Do.
Cle-alum Lake	do	do	Do.
Bumping Lake	do	do	Do.
Conconully	do	do	Do.
Bering Sea	Feb. 27, 1909	Alaska	Do.
Pribilof [1]	do	do	Do.
Tuxedni	do	do	Do.
Farallon	do	California	Do.
Culebra	do	Porto Rico	Do.
Yukon Delta	do	Alaska	Do.
St. Lazaria	do	do	Do.
Bogoslof	Mar. 2, 1909	do	Do.
Clear Lake	Apr. 11, 1911	California	Do.
Forrester Island	Jan. 11, 1912	Alaska	Do.
Hazy Islands	do	do	Do.
Niobrara	do	Nebraska [2]	14,640 acres.
Green Bay	Feb. 21, 1912	Wisconsin	1.87 acres.
Chamisso Island	Dec. 7, 1912	Alaska	Unknown.
Pishkun	Dec. 17, 1912	Montana	Do.
Desecheo Island	Dec. 19, 1912	Porto Rico	Do.
Gravel Island	Jan. 9, 1913	Wisconsin	Do.
Aleutian Islands	Mar. 3, 1913	Alaska	Do.
Canal Zone [3]	Mar. 19, 1913	Panama	Do.
Walker Lake	Apr. 21, 1913	Arkansas	Do.
Petit Bois Island	May 6, 1913	Alabama and Mississippi	Do.
Anaho Island	Sept. 4, 1913	Nevada	247.73 acres.
Smith Island	June 6, 1914	Washington	Unknown.
Dungeness Spit	Jan. 20, 1915	do	226.02 acres.
Ediz Hook	do	do	83 acres.
Mille Lacs	May 14, 1915	Minnesota	Unknown.
Big Lake	Aug. 2, 1915	Arkansas	Do.

[1] Transferred to Bureau of Fisheries.
[2] Approximate area.
[3] Under jurisdiction of Isthmian Canal Commission, Canal Zone. Strictly speaking, not a bird reservation, but birds are protected by Executive order.
Total reservations, including Canal Zone, 70.

Bird reserves enlarged, reduced, and abolished.

Name of reservation.	Date.	Location.	Area.
Pelican Island	Jan. 26, 1909	Florida (enlarged)	Unknown.
Mosquito Inlet	Apr. 2, 1909	do	Do.
Cold Springs	Nov. 25, 1911	Oregon (enlarged)	Do.
Clear Lake	Jan. 13, 1912	California (reduced)	Do.
Minidoka	Feb. 21, 1912	Idaho (enlarged)	Do.
Niobrara	Nov. 14, 1912	Nebraska (enlarged)[1]	15,253.7 acres.
Deer Flat	Apr. 21, 1915	Idaho (reduced)	Unknown.
Blackbeard Island	May 25, 1915	Georgia (abolished)	Do.
Klamath Lake	May 14, 1915	Oregon and California (reduced).	Do.

[1] Approximate area.

As appears from this list, these reservations are scattered between Alaska and Porto Rico. After careful consideration, based upon representations made by this department, the Isthmian Canal Commission secured an Executive order for the protection of the native birds within the zone, which, in its punitive features, conforms to section 84 of the United States Penal Code. Jurisdiction over the Canal Zone reservation is, however, retained by the Isthmian Canal Commission instead of being placed with the Department of Agriculture, as is the case in all other Government bird reserves.

ELEEMOSYNARY INSTITUTIONS.

GOVERNMENT HOSPITAL FOR THE INSANE.

Movements of population.—On June 30, 1915, there were remaining in the hospital 3,076 patients, as against 3,062 remaining on June 30, 1914, an increase of 14 patients over the previous year. There were admitted during the year 656 patients. The total number of patients treated during the year was 3,718. The number of discharges during the year, including deaths, was 642. The daily average number of inmates was 3,032, as against 3,025 of the previous year, an increase of 7.

Patients during the fiscal year ended June 30, 1915.

	Male.		Female.		Total.
	White.	Colored.	White.	Colored.	
Remaining June 30, 1914	1,875	392	507	288	3,062
Admitted during the year	365	106	109	76	656
Total number under treatment	2,240	498	616	364	3,718
Discharged:					
Recovered	81	10	16	10	117
Improved	39	11	16	7	73
Unimproved	58	13	15	13	99
Not insane	10	2	1	3	16
Died	208	57	36	36	337
Total	396	93	84	69	642
Remaining June 30, 1915	1,844	405	532	295	3,076

Daily average, male, 2,225; female, 807.50; total, 3,032.50.

Improvements.—During the year the criminal department of the hospital has been surrounded by a 24-foot cement wall, which materially increases the safety with which this class of patients can be cared for. New dairy barns have been completed, with accommodations for 200 cows. These barns house the hospital herd, which has been developed carefully during the past few years, and which is now, relatively speaking, of pure Holstein stock. The herd insures an ample supply of very high-grade milk to the hospital, a very important element of diet, especially for the sick. A new piggery has been built, providing for a larger herd of hogs than in the past, which it can support to great economic advantage. At the close of the fiscal year the final contracts were let, which complete the remodeling of the power, heat, and lighting plant, which has been in progress now for some years. This remodeling comprised, in the main, the consolidation of the three-boiler plants into one, the substitution of alternating for direct current, the rewiring of a considerable number of buildings, the removal of the electric-light wires from the tunnels occupied by the steam pipes and placing them in terra-cota conduits by themselves, the substitution of electrical-driven for steam-driven pump, the installation of automatic stokers, coal-handling and ash-handling machinery, and soot blowers. These changes, while they have been extensive, were rendered necessary because of certain extremely dangerous parts in the previous installation, also for the purpose of putting the institution in a position which would enable it to expand by the addition of more buildings with the least possible cost for electrical installation and maintenance, and it is also expected that the plant will run to a very much greater economic advantage. In fact, although the work has not yet been completed, the advantages of what has already been done in saving of coal consumption is quite evident. The items mentioned are the largest items of construction which have been completed during the past year. Many other smaller items, however, have received attention, to wit: Quarters for employees have been improved, old quarters have been remodeled, considerable laundry machinery has been purchased, and in each instance with the most approved safety devices attached; the high-pressure fire line has been extended, and several minor improvements made in the fire protection of the hospital; the sewer system has been extended and brought into more complete connection with the district system of sewage, and many other minor matters have received attention.

An effort has been made during the past year to extend the industries for patients. A workroom was opened in the basement of Howard Hall, in which all of the brooms and whisk brooms for the institution are made, a large amount of repair work is done, and a considerable number of mats are turned out. Material has also

been purchased for the installation of a brush-making shop, which will be put in the basement of one of the detached group of buildings.

Especial attention has been focused upon increasing the facilities for the actual treatment of the individual patient. Much larger opportunities are given the members of the staff to perfect themselves in the technique for the various laboratories by rotating the younger men for service in these different departments. The field of mental medicine has become so broad in specializing in its various departments and has become so considerable that it is difficult to get the younger physicians to keep from specializing long enough to get a broad grasp of all of the problems involved. To this end they are given special instructions and are required to serve in the pathological laboratory where they come into contact with pathological, histological, and serological, and the psychological laboratory, where they receive special instruction by the psychologist in methods of investigation, diagnosis, and treatment, particularly of organic central nervous system lesions, and disorders of the peripheral mechanisms, and upon the acute services, where they come under the immediate instruction of the clinical psychiatrist. It is believed that more is being done for the individual difficulties of the patients than ever before.

A plan was adopted by the Secretary of the Interior covering the installation of a relative cost system at the hospital, and a contract has been entered into with a meter company for furnishing and installing measuring devices in connection with the power, heating, and lighting system to be used in carrying out such plan. This system, when it is carried into effect, will be greatly in the interest of the better administration of the affairs of the institution.

The House Committee on the District of Columbia, which investigated the accounts between the Government Hospital for the Insane and the District of Columbia covering the support, clothing, and medical treatment of the patients admitted from the District, has completed its work and made a report in which it is stated that the balance due the United States from the District of Columbia for the fiscal years 1879 to 1912, inclusive, on account of unpaid board was $282,754.26; for the interest on unpaid balance $203,770.01, making the total amount due the United States $486,524.27. (H. R. Doc. No. 1628, 63d Cong., 3d sess.)

A very large proportion of the land along the Anacostia River adjacent to the hospital property, which has been reclaimed by the War Department, appears to have been drained to such an extent that it can be used for farming. A portion of this land has been leased by the War Department to certain parties who are now in possession. The interests of the Government and the hospital, it would seem, would be best subserved by a transfer of the supervision

of this land from the Secretary of War to the Secretary of the Interior in order that the hospital might be permitted to cultivate and utilize this land in the interests of the institution. A recommendation to this effect has been incorporated in the estimates that have been submitted to Congress.

In 1912 a committee of six, consisting of Surg. Gen. George H. Torney, United States Army, representing the Secretary of War; Surg. A. W. Dunbar, representing the Secretary of the Navy; Mr. Robert V. La Dow, superintendent of prisons, representing the Attorney General; Maj. William V. Judson, Corps of Engineers, United States Army, representing the Commissioners of the District of Columbia; Mr. Scott C. Bone, representing the board of visitors of the Government Hospital for the Insane; and Dr. William A. White, superintendent of the Government Hospital for the Insane, representing the department, were, after consultation with the President, designated by the Secretary of the Interior to make a thorough investigation of the needs of the hospital and the future policy for its growth and development; their report on the subject was subsequently transmitted by the President to Congress for consideration. (S. Doc. No. 256, 62d Cong., 2d sess.) This report discusses very fully the needs of the hospital under four heads: (*a*) Defects in the laws governing the conduct of the institution and the commitment of patients. Under this head is included a draft of proposed legislation for commitment from the District of Columbia, along with certain changes in the legislation with reference to the transfer of Federal prisoners to the hospital. (*b*) The advisability of continuing in the hospital patients committed from the District of Columbia and from the Army and Navy and from distant points. Under this head is discussed the whole question of the future policy of the hospital with reference to the commitment of patients from distant points. (*c*) The policy to be adopted relating to the growth of the institution, and the matter of additional lands, buildings, equipment, etc. Here the questions of administration, size of the institution, and its physical needs are discussed, together with a special report as to the care of the criminal insane. (*d*) The present conduct of the institution, including recommendations for improvement of the service and the advancement of the interests of the inmates. Under the third section the needs of the hospital are set forth. The recommendations contained in this report are commended to the further consideration of Congress.

FREEDMEN'S HOSPITAL.

Movements of population.—There were admitted into the hospital during the year 3,348, including 307 births. These, with 187 remaining from the preceding year, make a total of 3,535 indoor patients

receiving treatment. Of those received during the year 1,674 were chargeable to the District of Columbia, 1,389 to the General Government, and 285 paid for their care and treatment.

There were discharged during the year 3,354 patients; of this number 1,559 as recovered, 1,267 as improved, 261 unimproved, not treated 11, and 256 died. Of the total number discharged, 276 were pay patients and 3,078 were indigents. During the preceding year the number of deaths was 276, as against 256 from all causes during the past year. This is not to be regarded as a very high death rate when it is considered that a large number of patients come from homes surrounded by the worst sanitary conditions, half fed, improperly clothed, and seeking hospital treatment as a last resort.

At the close of the year there remained 181 patients; 15 were pay, 102 United States indigents, and 64 District of Columbia indigents.

There were 2,296 surgical operations performed, being an increase of 35 per cent over last year, with a mortality of 2.1 per cent; a remarkably low death rate considering the desperate condition in which many surgical cases are found at the time of entrance into the hospital.

In the dispensary, or out-patient department, 5,874 patients were treated. There were 15,185 revisits made by patients while undergoing treatment in the several clinics, and 2,609 surgical dresssings were necessary. Much of the difficulty heretofore experienced in getting patients to revisit the dispensary at stated intervals for continued treatment is gradually being overcome, due, doubtless, in a large measure to the increasing confidence in hospital treatment by this class of patients as well as to the benefits derived therefrom.

At the time of the opening of this hospital in 1875 there were 190 patients; in 1885, 10 years later, the number of patients accommodated was 1,794; in 1895 the number of patients was 2,476; in 1905 the number treated was 2,918; and in 1915 there were treated 3,535.

Pay patients.—In the act "making appropriations to provide for the expenses of the District of Columbia for the fiscal year ending June 30, 1913, and for other purposes," approved June 26, 1912, provision is made, under the head of "Medical charities," as follows:

> Hereafter patients may be admitted to Freedmen's Hospital for care and treatment on the payment of such reasonable charges therefor as the Secretary of the Interior may prescribe. All money so collected shall be paid into the Treasure to the credit of Freedmen's Hospital, to be disbursed under the supervision of the Secretary of the Interior for subsistence, fuel, and light, clothing, bedding, forage, medicine, medical and surgical supplies, surgical instruments, repairs, furniture, and other absolutely necessary expenses incident to the management of the hospital, a report as to the expenditure thereof to be made annually to Congress.

Under this provision the hospital has received a class of patients who had for many years sought the benefits of its care and treat-

ment, 285 being received for treatment, including 28 births, during the third year of its operation. The receipts for the care and treatment of this class of patients amounted to $5,750.10.

There is now in possession of the hospital about $160 left by deceased patients. All efforts to locate their heirs or legal representatives have been fruitless. Legislation should therefore be enacted by Congress authorizing the proper disposition of such moneys.

A building for pathological work is urgently needed, as the hospital can not render full measure of professional service to its inmates without the aid of proper facilities for a complete scientific investigation of their ailments. An assistant anesthetist should also be provided to properly safeguard all patients to whom anesthetics are to be administered. An additional engineer is necessary to provide for a strict compliance with the eight-hour law and to operate the central heating plant with the proper force. Provision should also be made for a general storekeeper, the present practice of several persons receiving, checking, and issuing supplies at different times being unsatisfactory and tending to inefficiency.

Receipts and disbursements.—The receipts and disbursements of the hospital may be stated as follows:

RECEIPTS.

Appropriation, sundry civil act:		
For support	$28,000.00	
Salaries	32,640.00	
Painting, special repairs, improvements, etc	6,000.00	
		$66,640.00
Appropriation, District of Columbia (under contract with Board of Charities)	34,965.35	
Pay patients	5,750.10	
		40,715.45
Total		107,355.45

DISBURSEMENTS.

Miscellaneous:		
Fuel, light, clothing, forage, medicine, etc	33,862.03	
Painting, special repairs, improvements, etc	5,990.42	
Pay patients	3,056.16	
Subsistence	28,581.50	
Pay patients	412.04	
Salaries	32,619.17	
Pay patients	2,040.00	
Refunds, pay patients	218.70	
		106,789.02
		566.43

HOWARD UNIVERSITY.

The university was incorporated by the act of March 2, 1867 (14 Stat., 438). The object of the incorporation named in the first section of the act was "for the education of youth in the liberal arts

and sciences." It is declared that the incorporators shall be "a body politic and corporate, with perpetual succession," etc. The management and control of the institution were vested in a board of not less than 13 trustees.

Students.—There were in attendance during the year 1,452 students from 36 States and 6 foreign countries. This number does not include 61 students who took work in the school of theology by correspondence. The number of students in the different departments was as follows:

Students during year ended June 30, 1915.

Colleges of arts and sciences	365
Teachers' college	202
School of manual arts and applied sciences	10
Conservatory of music	94
School of theology	110
School of medicine	288
School of law	106
Academy	298
Commercial college	96
	1,569
Names duplicated because of students taking special courses in different departments	117
Correct total	1,452

It will be seen that this number is slightly less than that of 1913–14, which was 1,463. Two hundred and five students completed their studies in the university, as follows:

Colleges of arts and sciences	30
Teachers' college	30
Normal course	5
Kindergarten	3
Domestic science	4
School of manual arts and applied sciences	2
Conservatory of music	1
School of theology	10
Medical college	20
Dental college	24
Pharmaceutic college	13
School of law	21
Academy	29
Commercial college	13
Total	205

School of theology.—No part of any appropriation by Congress has ever been applied to support this department. It is under no outside control or direction. The school is interdenominational and welcomes all who are preparing for the best service in moral and religious work. The service to the people which is being rendered

in city and country by graduates shows the practical aims which are cherished by the school and the success in carrying them out.

The correspondence work of this school is growing in importance and numbers. The work of the school is being strengthened and widened from year to year.

The roll of students for the year was as follows:

Seniors	13
Middlers	15
Juniors	9
Special students	5
Unclassified	8
	50
Evening institute:	
Fourth year	8
Third year	6
Second year	11
First year	21
	46
Correspondence students matriculated as university students	14
Total	110
Correspondence students not matriculated as university students	61

Of these, 6 received degrees, 7 received diplomas, and 7 received testimonials.

Twenty were graduated from the school in medicine, 24 in dentistry, and 13 in pharmacy; and in the school of law 21 students received degrees, while 30 received degrees from the college of arts and sciences. Forty-two received degrees and diplomas in the teachers' college.

The president of the institution, in commenting upon the needs thereof, states that:

It is scarcely possible to overestimate the worth of the work Howard University is doing for the population of the whole country, white and black. As the higher education produces its proper effects upon the colored race the welfare of both races is affected for the better. It is for the advantage of both races that our lawyers, doctors, dentists, druggists, ministers, teachers, and business men should go out with high training. The numbers under our care promise to grow larger and larger.

In order to handle this great student body successfully, we need, first of all and at once, an adequate auditorium. In any general exercise we can seat only a small part of the whole number. We need a hall of music for our growing conservatory, which is in cramped quarters; a suitable indoor gymnasium; and an administration building for our present ill-arranged business offices. We need larger laboratories and added equipment in various departments. We need two or three professorships in order to bring our work up to the scope of the best college standards. The need of these things is pressing upon us acutely. We need relief in some way before long.

We try to train our students not only in classroom work, but in patriotism and morals. Civic duties are emphasized by many lectures. A spirit of service is cultivated. We commend this university as one of the great, wholesome, and beneficial institutions of the country.

Appropriations.—Although the institution was established in 1867, no appropriation was made by Congress for its support until March 3, 1879, when $10,000 was appropriated "for maintenance." From that date up to March 4, 1915, the date of the approval of the last sundry civil act, Congress has appropriated for the university a total of $1,781,340.

Property.—The treasurer of the institution in a report dated October 1, 1915, says the total value of all property belonging to the university at the close of the fiscal year, June 30, 1915, was $1,716,518.74, of which $409,383.13 represents endowments, unproductive land fund, cash in bank, etc. The remainder of the property belonging to the university, valued at $1,307,135.61, consists of the following: Land, $615,691.50; buildings, $551,923.91; and equipment, $139,520.20.

This large property has been accumulated mainly from donations and the sale and the increase in value of about 120 acres of land originally purchased and subdivided by the university. The annual congressional appropriations have been mainly for the payment of salaries, the purchase of supplies, care of grounds, and other current expenses. Two buildings and a portion of the equipment thereof have also been provided from Government appropriations.

On January 6, 1911, the president of Howard University advised the department that the board of trustees of the institution had adopted the following resolution:

> It is the sense of the board of trustees of Howard University that the act of Congress dated March 2, 1867, be amended by the addition thereto of the following sections:
>
> XI. In the event that any of the buildings erected for the university by moneys appropriated by Congress shall cease to be used for the purposes of education as provided in the first section of the said act of Congress, the title to the said buildings and the land on which they stand shall vest in the United States in fee simple.
>
> XII. Hereafter the United States shall be represented on the board of trustees of Howard University by at least five judicial or executive officers who shall have been nominated by the President and confirmed by the Senate of the United States for such offices.

The Government, however, up to this time has had no representation on the board of trustees of the university, and has no title to the buildings erected or improvements made to buildings from congressional appropriations. In the annual reports for the last four preceding years the Secretary of the Interior in discussing this subject has said:

> Considering the magnitude of the appropriations made by Congress for the maintenance, improvement, etc., of the university and the statement of the president thereof, it is manifest that the Government should have greater supervision over the institution, and it is therefore recommended that the act of incorporation of March 2, 1867, be so amended as to give the Government

a proper representation on the board of trustees, that appropriations made by Congress shall be expended under the direction of the Secretary of the Interior, and that the institution be required to protect the United States against possible transfer or loss of the lands upon which buildings have heretofore or may hereafter be erected from funds provided by the Government.

COLUMBIA INSTITUTION FOR THE DEAF.

The number of deaf pupils and students remaining in the instution on July 1, 1914, was 110; admitted during the year, 41; total, 151; admitted for the school year 1915–16, 37. From July 1, 1914, to July 1, 1915, there were under instruction 85 males and 66 females; a total of 151; of whom 108 have been in the collegiate department, representing 34 States, the District of Columbia, Canada, and Wales; and 43 in the primary department. Of these 35 were admitted as beneficiaries of the District of Columbia. During the fiscal year 32 were discharged from the institution by graduation and otherwise.

One case of typhoid fever and two cases of diphtheria were successfully treated; the general health of students and pupils, however, was good. A dental room was conducted during the year.

The course of instruction was not changed, except for the extension of work in business methods. Regular instruction in agriculture began last year and has been continued with success.

The total receipts for the year, including $1,130.84, cash on hand July 1, 1914, were $119,655.63; the total expenses were $118,810.56; leaving a cash balance on hand June 30, 1915, of $845.07.

At the close of the year the following degrees were conferred: One master of arts, 1 bachelor of pedagogy, 5 bachelors of arts, 2 bachelors of science, 1 bachelor of letters, and 3 normal certificates.

The department has no supervision over the expenditures of the appropriation made by Congress or general supervision over the administration of the affairs of the Columbia Institution for the Deaf. The only duty devolving upon the Secretary of the Interior in relation to this institution at this time is the reception of the annual report thereof and the admission of indigent deaf-mutes of the several States and Territories to that institution for instruction in the collegiate branch thereof. Legislation should be enacted by Congress placing the control and maintenance of the Columbia Institution for the Deaf under the president and board of directors thereof, and requiring them to report directly to Congress as to the administration of the institution.

MARYLAND SCHOOL FOR THE BLIND.

Section 2 of the act of Congress approved May 29, 1858 (11 Stat., 294), authorizes the Secretary of the Interior to place for instruction in an institution for the blind, in the State of Maryland or some

other State, the indigent blind children of teachable age who are children of persons actually engaged in the military and naval services of the United States. No permits for this class of beneficiaries were issued during the past year.

SUPERINTENDENT OF THE UNITED STATES CAPITOL BUILDING AND GROUNDS.

The Superintendent of the United States Capitol Building and Grounds, in his annual report of the operations of his office, states under the head of general repairs that a new ventilating fan has been installed over the ceiling of the Supreme Court Chamber, that the central building has been whitewashed, and as a result of successful experiments in the lighting of the west main entrance of the Capitol by the installation of incandescent lamps in place of arc lamps it has been determined to carry this improved method of lighting to other portions of the terrace, north and south. Preliminary work has been started toward the reconstruction of the steps leading to the central section of the Capitol, new steps of granite having been determined upon to replace the old steps. In the resurfacing of the terraces of the Capitol the aim has been not only to provide a new surface, but to make this surface waterproof. To accomplish this the exterior surface has been removed; expansion joints formed and treated with a waterproofing compound adaptable to changes in temperature, the structural surface covered with sheets of cotton saturated with the waterproofing compound, all joints welded by ironing into a continuous sheet upon which has been laid the wearing surface of concrete provided with expansion joints at proper intervals, and around the edges these joints being filled with the compound referred to. Six thousand three hundred and thirty-two square yards of resurfacing have been completed. In the Senate wing of the Capitol new electric-light fixtures have been installed in the Senate lobby, Committee on Post Offices and Post Roads, marble room, reception room, and old post-office room, and the chandelier in the President's room has been remodeled and refinished, while a thorough cleaning and painting has been given the Senate Chamber and entrances, corridors, press gallery, restaurant, stairways, skylight room in crypt, toilets, and rooms of Committee on Rules, and those occupied by the Capitol police. All elevators have been repaired, new cables installed as needed, and by the introduction of equalizers a saving has been made in the number of feet of cable to be replaced. In the House wing of the Capitol electric-light fixtures have been installed in the Speaker's room and in that of the majority leader. The following rooms have been cleaned and painted: House Chamber, cloakrooms, Speaker's rooms, main entrances, Committee

on Appropriations, Clerk's office and rooms, restaurant, library station, skylights, and toilets. A new toilet and lavatory has been installed in the southeast corner of Statuary Hall, and in the heating and ventilating department the hot-water boilers have been equipped with new pipes, new Anderson traps fitted to the steam coils, new valves installed, and valves and other fittings repaired as needed. The elevators have been carefully inspected, and the old cables have been replaced by new as required.

Senate Office Building.—Extensive repairs have been made to the copper roofing to remedy the defects caused by storms. The post office of the Senate has been permanently transferred from the Capitol to this building and the office fixtures have been furnished in steel. The hot-water pipes have been covered throughout the entire heating system with a suitable covering, new awnings and shades of the best material have been installed, and general repairs attended to.

House Office Building.—In addition to the general maintenance, the stone coping has been gone over and thoroughly pointed up, the roof inspected and repaired, and preparations for the overhauling and painting of the rooms are being made. The approaches to this building at the corner of First and B Streets have been reset and are again in the course of repair.

Engine house and Senate and House stables.—In the Senate stable and engine house a new heating plant has been installed of sufficient capacity to heat all the buildings. New down spouts and guttering for the stable building and carriage shed have been installed, new floors laid, and minor repairs attended to.

Capitol power plant.—Conditions at the Capitol power plant have been marked by the high grade of service rendered and the absence of interruptions from breakdowns.

Botanic Gardens.—In addition to the customary repairs and necessary remodeling, there have been distributed to different sections of the country over 300,000 plants, trees, and shrubs, 29 new varieties of orchids have been added to the collection, and 8 bay trees have been purchased for the adornment of one of the walks.

Courthouse, District of Columbia.—Painting at the courthouse during the past year has been extensive, the suites of five justices, the offices of the marshal, register of wills, basement corridors, and over 40 other rooms in the building have been given attention.

Columbia Hospital for Women and Lying-in Asylum.—In October, 1914, the structural walls of this hospital, destined to be one of the finest maternity hospitals of the present time, were completed. Installation of the woodwork was completed in June, and the painting of the interior is now progressing rapidly. In the selection of the equipment the advice of experts in the various lines of equip-

ment was obtained and the best interests of the hospital carefully guarded.

Capitol Plaza.—Readjustment of practically all of the curb lines and grades of the plaza, the repairs and new installation of plumbing, the recutting and, in some instances, the purchase of new curbing, the removal in some places of the old concrete base, and the relaying of new base and entire new asphalt top are some of the changes which have been made in the Capitol Plaza. Forty-three thousand square yards of asphalt pavement have been laid; 2,550 cubic yards of extra concrete base has been placed; 7,280 square yards of new concrete paving has been put in place; 12,866 linear feet of vitrified gutter has been installed, and an equal number of feet of curbing has been taken up, recut, provided with concrete base, and reset.

Transfer of old material to other departments.—Under the provisions of the act of March 2, 1911, the old boilers formerly used in heating the Senate wing have been transferred to the Bureau of Mines and the Bureau of Standards, and two of the Babcock & Wilcox boilers, formerly used in the electric lighting plant of the House wing, have been transferred to the Home of the Aged and Infirm.

Enlarging the Capitol Grounds.—The act of August 26, 1912 (37 Stat., 594–605), imposes upon the Secretary of the Interior the duty of renting, until removed, property acquired under the act of June 25, 1910 (36 Stat., 739), and supplementary acts, for the enlargement of the Capitol Grounds.

As stated in my last annual report, there had been then acquired and turned over to the Superintendent of the United States Capitol Building and Grounds two squares, 634 and 685, on which were located 92 buildings, all of which have been removed except that occupied by the fire department of the District of Columbia, and the grounds have been graded as far as present conditions will permit. The joint resolution of October 22, 1914 (38 Stat., 781), provides that—

> Whereas awards for the payment of property taken in the condemnation proceedings for what are commonly known as the Plaza cases were made some time ago, and have been subject to examination by the Department of Justice to be approved by it and other authority; and
>
> Whereas the President has found it impracticable to separate the payments which are not in controversy from those which are, leaving those property owners whose claims are not attacked so that payments can not be made to them, involving great consequent hardship: Now, therefore, be it
>
> *Resolved by the Senate and House of Representatives of the United States of America in Congress assembled*, That the President of the United States shall appoint a commission of three men to complete the acquisition by the United States of so much of the real estate in square six hundred and thirty-two, six hundred and eighty, six hundred and eighty-one, six hundred and

eighty-two, six hundred and eighty-three, six hundred and eighty-four, seven hundred and twenty-one, seven hundred and twenty-two, seven hundred and twenty-three, and also that part of square six hundred and thirty-three lying east of Arthur Place, in the District of Columbia, as in the opinion of the President is desirable for the extension of the Capitol grounds.

Since the appointment of this commission and during the fiscal year 1915 the Government has acquired title to the following property: Three pieces of improved property in square 633, 17 lots in square 680, 2 pieces of improved property in square 683, 3 pieces of improved property in square 684, south half of square 721, all of square 722, and all of square 723 except 4 lots and 6 pieces of improved property. The unimproved property has been turned over to the Superintendent of the United States Capitol Building and Grounds upon acquirement of title thereto, and the improved property has been turned over to him as it became vacant. The work of removing the buildings and grading the grounds is progressing as rapidly as conditions will permit. Rents have been collected and deposited in the Treasury by the chief disbursing clerk of the department, amounting in the aggregate to $1,775.52.

GENERAL EDUCATION BOARD.

This corporation, which was created by the act of Congress approved January 12, 1903, section 6 of which requires the corporation to annually file with the Secretary of the Interior a report, in writing, stating in detail the property, real and personal, held by the corporation, and the expenditure or other use or disposition of the same or the income thereof during the preceding year, has for its object the promotion of education within the United States. The corporation owns no real estate, its property consisting of securities and money divided into various funds, according to the purpose for which it is to be used.

On June 30, 1915, the principal funds belonging without restriction to the board amounted to $33,958,848.40, invested in stocks and bonds.

The income from the above funds, together with the income from undisbursed income, including income earned but not received, amounted during the year to $2,230,425.41. The balance of income from previous years as of June 30, 1914, amounting to $5,223,863.68, increased the total to $7,454,289.09.

Disbursements from income during the year were as follows:

To schools and colleges	$1,021,425.97
Southern farmers' cooperative demonstration work	15,947.52
Girls' canning and poultry clubs	17,345.92
Maine farmers' cooperative demonstration work	14,105.51
Maine boys' and girls' club	4,491.62

New Hampshire farmers' demonstration		$9,998.70
Rural organization service		36.45
Rural school agents	$38,952.35	
Deduct amount given by the Southern Education Board for this work	9,000.00	
		29,952.35
Negro rural school supervisors		24,877.39
Salaries and expenses, professors of secondary education		32,644.27
Secretary's contingent fund		2,475.71
Lafayette College		257.72
Richmond College		901.86
Public Health Service Conference		312.05
Maryland survey	$3,668.31	
Deduct amount refunded by the Maryland Educational Survey Commission	2,500.00	
		1,168.31
Home Makers' Club		3,598.84
Expenses		61,692.91
Total		1,241,233.10

This leaves an undisbursed balance of income on June 30, 1915, of $6,213,055.99. It is invested as follows: Bonds and stocks, $5,526,700.53; accrued income, $273,613.56; accounts receivable, $9,477.60; cash, $403,264.30.

It should be noted, however, that against this balance there are unpaid appropriations amounting to $6,011,563.64.

The John D. Rockefeller special fund is a fund which Mr. Rockefeller controls as to principal and income.

In a previous report a gift to the University of Chicago of $9,912,540.74 was published. One-tenth of this gift (or securities and cash representing it) is payable each year. The income from the unpaid balance, however, remains the property of the board, subject to Mr. Rockefeller's direction. The principal of this fund, as mentioned in my last report, has been completely used up so that only the income account now is open.

The income earned during the year was $277,270.61 plus the profit on invested income, $691.71 plus the balance from previous years ($510,708.38) brings the amount to $788,670.70.

Disbursements during the year were as follows:

Gift to the University of Chicago	$20,000.00
Expenses	836.57
Total	20,836.57

This leaves a balance of $767,834.13, which is invested as follows: Bonds and stocks, $538,114,98; accrued income, $44,574.25; accounts receivable, $1,163.95; cash, $183,980.95.

The Anna T. Jeanes fund, the income to be used for negro rural schools, amounts to $200,000. It is invested as follows: Bonds, $182,877.51; stocks, $16,645; cash, $477.49.

The income from this fund during the year was $7,910.46. Added to the balance from the previous year, the total available income amounted to $17,910.46. Of this $8,812.70 was appropriated and paid to various schools, and $40.10 paid out for expenses, leaving a balance of $8,307.68 in cash.

IMPROVEMENTS AT LAWTON, OKLA.

By the act of Congress approved March 27, 1908 (35 Stat., 49), it was provided—

That the Secretary of the Interior be, and he is hereby, authorized and directed to plat and sell in accordance with section twenty-three hundred and eighty-one of the Revised Statutes of the United States the following-described tract of land, to wit: The south half of section thirty, township two north, range eleven west, of the Indian meridian, in the State of Oklahoma: *Provided*, That the Secretary of the Interior shall reserve from said tract of land, when surveyed, one block for public-park and two blocks for public-school purposes, and shall cause to be erected two suitable school buildings out of the proceeds arising from said sale, the remainder of proceeds, after deducting the expenses necessary to carry out the provisions of this act, to be converted into and become a part of the fund belonging to the Comanche, Kiowa, and Apache Tribes of Indians: *Provided further*, That said sale shall be made as soon as practicable after the approval of this act.

The act of Congress approved February 18, 1909 (35 Stat., 636), provides for extension of time of payments on certain homestead entries in Oklahoma and amends the above act in the following language:

The Secretary of the Interior is hereby authorized, in his discretion, to extend the time of payments to the purchasers and their assigns applying therefor upon the lots sold, or to be sold, in pursuance of an act entitled "An act providing for the platting and selling of the south half of section thirty, township two north, range eleven west, of the Indian meridian, in the State of Oklahoma, for town-site purposes," approved March twenty-seventh, nineteen hundred and eight, and the Secretary of the Interior is authorized to permit the unpaid purchase money for such lots to be paid in such installments and at such times as he may deem proper: *Provided, however*, That said purchasers or their assigns shall be required to pay interest on all such deferred payments sufficient to pay the Kiowa, Comanche, and Apache Indians four per centum interest on the payments so deferred, and to pay the local authorities entitled to receive the same the equivalent of the State, county, city, and school tax at the legal rate upon such valuation as the Secretary of the Interior may determine, and to which the lots would be liable if patented, such extension of time not to exceed four years from the date of the approval of this act: *Provided further*, That not exceeding one-half of the amount which may be set aside by the Secretary of the Interior, under the act above referred to, for the construction of two school buildings may be applied by the Secretary of the Interior to such other improvements as he may deem for the public welfare.

By section 30 of the act of May 29, 1908, 20 per cent of receipts of sales from the above-mentioned source was set aside for use in con-

nection with the construction of a courthouse and post-office building at Lawton, Okla.

The sum of $149,047.03 from proceeds of this sale having at request of this department been placed to the credit of the appropriation, school buildings and other improvements at Lawton, Okla., plans and specifications were accordingly prepared for a 10-room schoolhouse to be located on block 31 of the north addition to Lawton and designated as school building No. 1. Contract for the work was let to the McHenry-Beatty Co., of East Liverpool, Ohio, and the building was completed at a total cost, including sidewalks, architect's fees, and supervision of work, of $54,822.96. Contract was also let to E. M. Eby for the construction of a sanitary sewer, which was completed at a total cost, including plans and supervision work, of $25,867.94.

On April 24, 1911, contract was let, after due advertisement, to the same firm for construction of an additional 10-room school building to be located on block 26 of the north addition to Lawton and to be designated as school building No. 2, and for the laying of sidewalks around it. This building, with sidewalks, was completed, including the furnishing of the manual training department, at a total cost of $66,332.33.

School building No. 1 was formally turned over to the authorities of Lawton on August 31, 1911, the sanitary sewer system on April 3, 1911, and school building No. 2 on April 20, 1912, and all are now in use.

The Comptroller of the Treasury having decided on May 7, 1914, that the Secretary of the Interior was authorized to expend on other public improvements at Lawton one-half the total amount of cost of the two school buildings (thereby fixing as amount of the appropriation for school buildings and other improvements at Lawton, Okla., the sum of $181,732.93), upon request of the city authorities plans and specifications were prepared by the department for a storm-sewer system for the north addition to Lawton. Contract was let, after due advertisement, on January 4, 1915, to Mayfield & Shaw, of that city. The sewer system was completed on August 21, at a total cost of $28,674.65, and was turned over to the city authorities on September 8, 1915.

As there was an unexpended balance approximating $6,000 left available after completion of the storm-sewer system for expenditure in future improvements, plans and specifications were prepared by the city of Lawton and approved in the department for grading those portions of Gore Boulevard, in Lawton, designated as central parking, north and south driveways, and cross streets. Proposals have been solicited by advertisement for this work, returnable on November 17, 1915.

PROTECTION OF LANDS AND PROPERTY IN IMPERIAL VALLEY, CALIFORNIA.

Construction works for protecting lands and property in the Imperial Valley, and elsewhere along the Colorado River within the limits of the United States, in continuation of the work done in 1910–11 and 1914 under the joint resolution of June 25, 1910, were recommended in a letter to the Secretary of the Treasury January 15, 1915, published in House Document No. 1475, Sixty-third Congress, third session, and an estimate of $250,000 therefor submitted.

The sundry civil act of Congress approved March 3, 1915, appropriated for this purpose $100,000, the expenditure to be contingent upon the deposit in the United States Treasury of an equal amount by the Imperial Irrigation District, Cal., all to be expended under this department, and authorized the expenditure of money within the limits of the Republic of Mexico in accordance with such agreements as may be made with the Republic of Mexico.

There was also an unexpended balance of about $8,400 of the appropriation of 1910 available for the work.

Upon the passage of the act, a notification that the contribution demanded from Imperial Irrigation District had been collected was received, and later that on May 7 forces from Imperial Valley had been sent into Mexico to begin work in advance of deposit of funds or compliance with other conditions of the act.

There being no central government in Mexico, agreements were made with the local military authorities in Lower California and with the land owners, in strict accord with Mexican laws, for execution of the work, all of which was in the Republic of Mexico, and the work continued without interruption from March 7 to June 15 on the raising and extension of the Volcano Lake levee, under a contract for labor with a Mexican corporation, as required by the Mexican laws; and also from April 9 to July 1, 1915, under other contracts on revetting the caving banks of the Colorado River, near the old break closed in 1907, where there was, as shown in the document above referred to, imminent danger that the flood waters of the Colorado would undermine the levee and again flow into the Imperial Valley via the Paradones and Alamo Rivers.

A number of freshets, one of them producing a great flood—approximately 100,000 cubic feet per second—poured out from the southern tributaries of the Colorado during the winter of 1914–15, carrying vastly greater loads of sand and mud than usual floods in the Colorado and materially increased the deposits in the Volcano Lake region and the danger to the Volcano Lake levee, by raising the flood level in Volcano Lake and against the inadequate levee that has been relied upon to prevent overflows of flood water through

Mexican territory, due to the change in the course of the Colorado River in 1909.

For this reason it appeared necessary to raise the Volcano Lake levee and to strengthen it on the western or lower section of it where it crosses the Volcano Lake flat, which was not contemplated in House Document 1475, as the conditions requiring this modification became evident after the publication of that document.

Volcano Lake levee was raised 2 feet in height, a banquette added in rear, and its slopes increased from two horizontal to one vertical to four horizontal to one vertical for the first 2 miles, and thence for 6½ miles built from 2 to 6 feet higher with crown of levee approximately parallel to the ground surface, as far as to the high ground north of the Paradones River near Arroyo Tortuoso. The levee of less dimensions was extended several miles farther toward the Inter-California Railroad at Bataques station as recommended to Congress, but funds were insufficient to satisfactorily complete this extension.

The height of the main levee varies from 9 to 11 feet for nearly 7 miles, and from 11 to 4 feet for the eastern 2½ miles.

All material that can be obtained in the vicinity of the western 3 miles of the levee, which constitutes the most important section, has been put into the levee. This material is essentially bad and unreliable, being composed of fine silt containing probably 15 to 20 per cent of soluble alkaline salts. The levee is likely to fail from saturation and can only be made safe, even against moderate heads, by strengthening it with sound material which must be transported from 1 to 4 miles. This will require a costly plant and much greater cost per cubic yard. No further useful work can be done on this part of the levee by ordinary team and scraper outfits.

In all 534,936 cubic yards were placed in the levee, and including all expenditures, including engineering, clearing, and grubbing, the cost per cubic yard was about 22 cents.

Revetment of river banks.—The levee from the heading of the Alamo Canal for 8 miles southward is very near the river, and has been for years in imminent danger of undermining by caving. In 1914 a breach occurred near mile 7 which was closed by a section of new levee around the crevasse, and about 4,500 linear feet of levee was attacked and temporarily secured by stone revetment. In March, 1915, an examination showed that the caving banks reached the levee for 2 miles, between miles 5 and 7 below the headworks, and in parts half or more of the thickness of the levee had caved into the river. Five thousand cubic yards of large stone from the Decles quarry was immediately purchased from and placed by the Southern Pacific Co. to stop the caving at the worst places until contract could be made for cheaper and more copious deliveries. Deliveries of stone in the revet-

ment of the banks began under contract April 9 and continued until May 20, when the banks had been revetted from near and below mile 7 to near mile 5, or about 11,000 feet, including the completion of the 4,500 linear feet partly revetted in 1914, and 25,000 cubic yards of stone in addition placed along the levee between miles 1 and 4 below the intake of the canal. This latter amount is insufficient to hold the levee against an attack, but will delay caving until more stone may be added to complete the protection.

After the contract for the revetment had been closed and the contractor's forces had been dispersed a change in the currents of the river indicated that an attack was threatened near the old break closed in 1907 and above the revetted section. There were no quarries open from which stone could be purchased, and the amount of stone required and time would not justify advertising. After a loss of 10 days, due to negotiations with the Southern Pacific Railroad regarding the passage of rock trains over its tracks, four trainloads of stone were transported from the Yuma project quarries and the revetment extended upstream about 200 feet, and the work was then considered safe; but on June 10 a new attack developed and the revetment had to be again extended upstream by placing 4,000 cubic yards more stone from the reclamation project quarries, or in all 5,600 cubic yards. This stone is very trashy and the greater part of it was at once washed away; 20,000 sandbags were then filled with stone and sand and used to supplement the rock. This work was completed on June 30. The caving was then within a quarter of a mile of the break closed in 1907. The river will probably destroy the levee here on its next rise, with possibly disastrous results.

It is useless to attack this problem with scant funds and out of season. In all about 81,000 cubic yards of stone were placed in the revetment in 1915 and 20,000 sandbags.

The river is now at low water, caving the banks along the front near and for quite a mile above the head of the revetment, and 4 miles up the levee is in imminent danger of destruction.

There have been no surveys made of the Colorado River delta, and the conditions to be met are unknown. All work done and projected has been based on insufficient data and as emergency work out of season and in a costly hurry.

The total expenditures in 1915 have been—

Office engineering, supervision, surveys, travel, and contingencies	$8,599.25
Revetment river front	81,035.52
Volcano Lake levee	111,766.63
Total	201,401.40

which includes $1,401.40 from the appropriation of June 25, 1910.

MEMORIAL TO JOHN WESLEY POWELL.

The International Geological Congress in 1904 considered the advisability of the construction of a suitable memorial of life service to Maj. John W. Powell, late Director of the United States Geological Survey, to be erected on the brink of the Grand Canyon of the Colorado, and appointed a committee for the purpose of promoting the project. Thereafter, the matter was brought to the attention of Congress by those interested, and in the sundry civil act approved March 4, 1909 (35 Stat., 992), Congress, among other things, provided:

> Memorial to John Wesley Powell: For the purpose of procuring and erecting on the brink of the Grand Canyon, in the Grand Canyon Forest Reserve in Arizona, a memorial to the late John Wesley Powell, with a suitable pedestal, if necessary, in recognition of his distinguished public services as a soldier, explorer, and administrator of Government scientific work, five thousand dollars: *Provided*, That the design for said memorial and the site for the same shall be approved by the Secretary of the Interior.

On March 4, 1909, the then Secretary of the Interior designated Dr. W. H. Holmes, Chief of the Bureau of Ethnology, Dr. C. D. Walcott, Secretary of the Smithsonian Institution, and Col. H. C. Rizer, chief clerk of the United States Geological Survey, as members of an advisory committee to assist him in determining the character of the memorial and the selection of the best site. Finding it difficult to reach any definite conclusion regarding the character of the memorial which would be appropriate and satisfactory without having a somewhat intimate acquaintance with the available sites for selection, the chairman of the committee, Dr. Holmes, visited the Grand Canyon in May, 1909, with a view to making the necessary observations. As a result of such visit the committee submitted a preliminary report recommending the selection of Maricopa or "Sentinel Point," on the rim of the canyon, from which the view of the Granite Gorge is awe-inspiring, as being the most suitable site, which was approved by the department, and the committee was authorized to look further into the matter of design and erection of the memorial.

On October 19, 1910, the committee submitted a further report, stating, among other things, that—

> In its report to you of June 24, 1909, the committee presented a number of suggestions that had been made touching the character of the proposed monument. After very full consideration the committee has concluded that the most feasible plan to follow is that embraced in the last-named suggestion there submitted, viz., a monumental seat or chair from which the canyon and the river could be viewed.
>
> A model of this plan is presented herewith.
>
> It is proposed to insert in the back of the chair a bronze medallion portrait of Maj. Powell with appropriate inscription. Owing to the limitations marked by the appro-

priation the committee finds that the only suitable material that can be adopted in construction is concrete.

It is therefore recommended that the committee be authorized to at once proceed to negotiate with responsible parties for effecting the above-indicated design. It is further recommended that the Director of the Reclamation Service be authorized to detail some competent person with experience to superintend the construction of the proposed design, the necessary expenses thus incurred to be paid from the sum of $5,000 heretofore appropriated for the erection of this monument.

This report was approved by the department October 20, 1910, and subsequently the committee submitted a tentative design for the memorial prepared by Mr. J. R. Marshall, of Washington, D. C., which was referred to the Fine Arts Commission for consideration. After certain modifications had been made by Mr. Marshall, the plans were approved by the commission on May 8 and by the department on May 11, 1914. The supervision of its construction was assigned to Mr. Walter Ward, engineer of the Reclamation Service, who on consideration of the plans expressed the opinion that it would be impracticable to construct the memorial thereunder within the appropriation, and suggested that they be modified by reduction in size of the memorial, etc. The department thereupon requested Mr. Mark Daniels, general superintendent and landscape engineer of national parks, to revise the plans, and suggested, among other things, that they provide for the erection of an altar on the foundations in lieu of the Roman chair previously decided upon, one side of the altar to contain an embedded bronze tablet.

These revised plans were approved by the Secretary on July 20, 1915. The tablet in which is embedded a medallion portrait of Maj. Powell in bas-relief (the work of Miss Lelia Usher, of New York), was cast by The Gorham Co., also of that city.

The work of construction was then commenced under supervision of Mr. Ward and the memorial was fully completed on October 26, 1915, at a cost within the amount of the appropriation.

Great credit is due to Mr. Stephen T. Mather, the Assistant to the Secretary, who personally looked after this matter, for the expeditious manner in which the work was prosecuted to completion and for the securing of the cooperation of the railroads and others during the period of construction.

MARITIME CANAL CO. OF NICARAGUA.

Section 6 of the act of Congress approved February 20, 1889, entitled "An act to incorporate the Maritime Canal Company of Nicaragua" (25 Stat., 675), provides:

Said company shall make a report on the first Monday of December in each year to the Secretary of the Interior, which shall be duly verified on oath by the president and secretary thereof, giving such detailed statement of its

affairs and of its assets and liabilities as may be required by the Secretary of the Interior, and any willfully false statements so made shall be deemed perjury and punishable as such. And it shall be the duty of the Secretary of the Interior to require such annual statement and to prescribe the form thereof and the particulars to be given thereby.

The report of this corporation when received will be duly transmitted to Congress. In view of the fact, however, that the Maritime Canal Co. of Nicaragua has no relations whatever with this department and the Secretary has no duty to perform thereto except as specified in the above-mentioned law, the act should be so amended as to require the corporation to submit directly to Congress such form of report as it may prescribe.

APPENDIX A.

DEVELOPMENT OF OUR MINERAL RESOURCES.

METALS.

PRECIOUS METALS.

GOLD.

The production of gold in the United States in 1880 was $36,000,000, while in 1914 the total domestic yield was $94,500,000. The world's output of gold is approximately $460,000,000, of which the United States produces 20 per cent, and is exceeded by South Africa only, with an output of $212,000,000. Europe, outside of Russia, is absolutely dependent upon the rest of the world for its gold supply.

The balance of trade in 1914 in gold, largely in the form of refined domestic bullion and United States coin, amounted to $165,300,000.

In 1914, 20 States reported an output of gold, the largest producers being California, Colorado, Alaska, Nevada, and South Dakota. The most productive areas are the deep mines of the Mother lode and Grass Valley districts and the Yuba and Butte dredging fields of California, the Cripple Creek district in Colorado, the Treadwell and placer mines of Alaska, the Black Hills district in South Dakota, and the Goldfield-Tonopah district of Nevada.

In the metallurgy of gold the chlorination process has been almost entirely superseded by the cyanide process. In the latter part of the year the supply of potassium cyanide ran short owing to the interruption of imports from Europe, but the shortage was apparently met by the substitution of sodium cyanide. The ore treatment plants of Colorado, New Mexico, and South Dakota used approximately 840,000 pounds of sodium cyanide and 775,000 pounds of potassium cyanide in 1913, and 1,600,000 pounds of sodium cyanide and only 125,000 pounds of potassium cyanide in 1914.

The average gold recovery from 11,000,000 tons of siliceous ores in 1914 was $5.53 per ton. The average gold per ton from the Alaskan deep mines was $2.78; from California, $5.46, and from South Dakota $3.63. Even with these low recoveries of gold per ton of ore, the dividend yield has been large.

Dredges for mining gold placers are largely an American innovation and have been developed by years of experience. They were

introduced about 1896, and since then have recovered about $100,000,000 in gold by reworking gravels, or working gravels that were too low in gold to be profitably mined by any other method. The production by gold dredges in 1904 was $2,600,000, but in 1914 had risen to more than $12,500,000. The gold-dredging industry is being rapidly extended to the immense areas of low-grade sands and gravels in Alaska. The largest productive gold-dredging companies are in California, Alaska, Montana, Colorado, Idaho, Oregon, and Nevada.

It is not possible to give an accurate estimate of the total reserves of gold ore in the United States, but it is safe to assume that they are sufficient for a long period of years. For example, at one of the large mines in southern Alaska there has just been completed a mill having a daily capacity of 6,000 tons of ore, and it is estimated that the ore reserves are between 75,000,000 and 100,000,000 tons.

Improved processes for the extraction of gold make possible the working of great low-grade deposits and thus enlarge the visible supply of ore. Any invention that tends to lessen the cost of production will increase the amount of ore from which gold may be extracted. Equal advances are being made in the mining and treatment of low-grade placer gravels by the introduction of larger and more efficient dredges that recover practically all of the gold in the gravel.

In treating gold ores by amalgamation followed by cyandiation about 90 per cent of the gold content is recovered. At some of the latest improved plants the loss does not exceed 5 per cent. The bulk of the domestic gold output is from siliceous ores (known as gold quartz) and from placers, over 91 per cent of the total production being from these two sources. The total amount of gold derived from the copper, lead, and zinc mines of the United States is therefore relatively small, notwithstanding their recent enormous development and tonnage. While this latter source of gold is not large, yet it is constant and can be depended upon, and it is barely possible that with more efficient metallurgical methods the amount of gold recovered as a by-product from such ores may be slightly increased.

As in years past, the supply of gold will continue to come from California, Alaska, Colorado, South Dakota, Nevada, and Montana. Many of the low-grade siliceous ores that are being profitably worked contain less than $3 per ton, and many more containing even less gold will constitute our main source of supply. The Alaska placers are an important source of gold for the United States, and the Government railroad from the coast to the interior should so cheapen costs that many placers from which the cream of the gold has been taken can be reworked and many placers that could not be profitably worked before will now contribute to the output.

SILVER.

In 1880 the United States produced 30,300,000 ounces of silver, valued at $34,700,000. The production has gradually increased until in 1914 the total amount produced, the largest ever recorded, was 72,400,000 ounces, valued at $40,000,000. The silver production of the world is estimated as about 225,000,000 fine ounces, of which the United States produces one-third. Practically three-fourths of the world's silver production is derived from North America, about 14 per cent from Europe, and the remainder mainly from Australia and Asia. The imports of silver in 1914 contained in foreign ore and base bullion amounted to approximately $26,000,000, while exports for the same period amounted to $51,600,000. The majority of the exports were to Europe, China, and India. The United States produces so much more silver than the domestic arts and sciences can assimilate that the price is largely regulated by the foreign demand. There is every reason to believe that the United States will continue to retain its position as the largest producer of silver and have a large surplus for exports. Twenty-five States produced silver in 1914. Nevada produced 15,900,000 ounces, mainly from the siliceous ores of the Tonopah district; Idaho 12,600,000 ounces, mainly from the Coeur d'Alene lead and lead-silver ore; Montana, 12,500,000 ounces, mainly from Butte copper ores; Utah, 11,700,000 ounces, mainly from copper and lead ores; Colorado, 8,804,400 ounces, mainly from siliceous and lead ores; and Arizona, 4,439,500 ounces, mainly from siliceous and copper ores. Almost 40 per cent of the silver produced in the United States is derived from siliceous (quartz) or dry ores, 21 per cent from copper ores, 28 per cent from lead ores, and 10 per cent from lead-zinc ores. High prices for copper and lead will have a tendency to increase the yield of silver which is recovered as a by-product.

The cyanide process applied to Tonopah ores and to those of other districts has permitted the treatment of lower-grade ores which otherwise could not profitably have been shipped to smelters. In 1911 about 14 per cent of the United States silver was recovered by cyanidation and in 1914 over 22 per cent. Experiments are being conducted under the direction of the department for perfecting details and cheapening the cost of treatment to make the process more widely applicable.

Vast quantities of low-grade complex ores carrying silver with lead, copper, or zinc are now unworked in the metal-mining States of the West because of the lack of processes by which the metals can be recovered at a profit. Investigations are in progress under the direction of the department to determine the extent of these ores and the possibility of developing processes for treating them profitably, thus greatly enlarging the available supply of silver-bearing ores.

PLATINUM.

In 1914 the United States produced 570 ounces of crude or 525 ounces of refined platinum from placer sands and 110 ounces from deep mines. In 1880 the total output was 100 ounces of crude platinum from placers. In all 3,430 ounces of refined platinum were recovered in 1914 from the electrolytic refining of gold bullion, platinum sands, and copper matte, of which probably 2,500 ounces came from domestic sources.

During 1914 about 70,000 ounces of platinum, having a value of $2,908,000, were imported into the United States. This was about 42 per cent below the 1913 imports and indicates the extent to which the world is dependent on Russia for platinum. The United States has never been an exporter of platinum. Russia produces about 90 per cent of the platinum of the world, and Colombia, South America, the next largest producer, about 6 per cent.

Within the last year English capitalists have given considerable attention to the Colombian platinum fields on the Condote, San Juan, and Atrato Rivers, in the Choco district, and some American capital is turning in that direction. With the Panama Canal an accomplished fact, and the many platinum refineries on our eastern seaboard, it does not seem reasonable that much of the crude platinum from Colombia will be taken to Europe for refining. The development of Colombian fields would be a boon to this country.

The placer fields of northern California and southwestern Oregon constitute the largest source of crude platinum in the United States, and it seems probable that they will continue to prove our most reliable source of this metal, because, as has been repeatedly shown, the quantity of platinum ordinarily found in veins is too small to be of commercial value. However, in the United States we have at least three places where enough platinum occurs in the rocks to offer possibilities for production. These are the Rambler mine in Albany County, Wyo.; the Boss mine and near-by properties in the Yellow Pine district, Clark County, Nev.; and the Great Eastern mine, about 25 miles northeast of Moapa, Clark County, Nev.

The platinum recovered by gold and copper refiners occurs in the original ores in such minute quantities that it is rarely determined in assaying. Only the immense tonnages of gold, copper, and silver ores treated annually render the platinum content of importance. Our output of this by-product platinum, as it may well be called, depends entirely on the production of the other metals, particularly copper, with which platinum seems to be most often associated.

Probably one of the most important uses of platinum in this country at the present time is in the manufacture of "fuming" sul-

phuric acid and sulphur trioxide, materials that are practically indispensable to the makers of high explosives and aniline colors. It is not possible to estimate the quantity of platinum tied up in the manufacture of sulphur trioxide, but the loss of platinum in the industry undoubtedly is very small. Should the price of platinum prohibit its use, sulphuric acid manufacturers could still make the fuming acid by substituting iron oxide for platinum.

In former years platinum was considered essential in electrical work where it is now replaced by "nichrome" and other alloys or metallic molybdenum and tungsten. In dental work, platinum plating gives as satisfactory results as the pure platinum formerly much used.

Probably our greatest economic waste of platinum at present is its increasing use as a setting for precious stones, but platinum settings may go out of style at any time and the platinum come back into the market. A large quantity of platinum is also tied up in the form of utensils in the various chemical laboratories throughout the United States.

Our domestic supply of platinum is entirely inadequate to meet present uses, but if these uses were cut to the essentials, it is believed that the United States could be independent of the world for some time. The western placer miners are realizing the practicability of saving the platinum as well as the gold, and new devices on gold dredges are saving much more of the platinum than those used heretofore. Further improvements seem likely.

The waste of such a valuable metal as platinum is very small, once the metal is on the market. It may be overlooked in placer mining, but in metallurgy it is not, as is shown by the large recoveries made by gold and copper refiners. The amount of scrap platinum handled during 1914, amounting to 40,500 ounces—more than 16 times our domestic production—shows the economy practiced in the use of this metal. Sweepings from jewelry manufacturing and dental establishments and scraps from every conceivable source that might contain platinum are refined and the metal recovered.

At the present time the United States Geological Survey and the Federal Bureau of Mines are cooperating in a general study of the placer deposits of the United States. This study is giving new information as to the places where platinum occurs and the best methods for its recovery.

QUICKSILVER (MERCURY).

The annual production of quicksilver in the United States is approximately 20,000 flasks of 75 pounds each, a total of 1,500,000 pounds, representing a total value of $800,000. During 1914 the

United States imported 615,000 pounds, largely from Italy, Austria, and England. The exports amounted to 108,000 pounds, mostly to South America, Canada, and France.

The chief producing districts in the United States are in California, that State yielding over two-thirds of the entire output. Texas, Nevada, and Arizona are small producers. Quicksilver is also found in Alaska, Washington, Oregon, and Utah, but many of these deposits have not been thoroughly prospected and developed.

The principal uses of quicksilver are in the manufacture of fulminate, in making electric appliances and in the milling of gold and silver ores. The quantity of quicksilver used for the latter purpose is much less than formerly because of the growing use of the cyanide process. Consequently more quicksilver is available for use in the manufacture of explosive caps and electrical appliances. More than 30 per cent of the gold mined in the United States is recovered by cyanidation, and only about 21 per cent by amalgamation, the total amount of quicksilver used for the purpose amounting to only 700 or 800 flasks a year.

The United States supply of quicksilver is ample for domestic use under normal conditions, and the increased use of wet processes for the extraction of gold leaves still more of the original supply available for other purposes.

BASE METALS.

IRON ORE AND PIG IRON.

In 1880 about 7,000,000 long tons of iron ore, valued at $17,500,000, were mined in the United States, as compared with 60,000,000 tons in 1913, valued at about $130,000,000. The production of pig iron increased in the same period from less than 4,000,000 tons to more than 30,000,000 tons, the value of which in 1913 exceeded $458,000,000. The United States leads the world in the production of these commodities, iron ore and pig iron, and produces annually about 40 per cent of the world's supply of iron. This is shown graphically in fig. 2.

Comparatively little iron ore is imported into the United States—less than one-half of 1 per cent of the quantity annually mined. Moreover, the exports of iron ore from the United States nearly offset the imports, so that the United States is self-sufficient so far as the production of iron ore is concerned. Such ore as is imported comes mainly from Cuba, Sweden, Newfoundland, Canada, Spain, and Chile. It is possible to import high-grade iron ores, such as are received from the above countries, for use along the Atlantic seaboard when ocean freights are low and there is no tariff on the ore. Even under these favorable conditions, however, foreign ore rarely gets beyond the tidewater furnaces.

The United States is abundantly supplied with iron ore, yet there are excellent arguments in favor of encouraging imports of ore from Cuba and South America. Iron ore forms the basis of the largest manufacturing industry in the United States. The profits to both labor and capital are made from the manufacture and sale of iron and steel products rather than from iron ore mining, therefore, so long as the United States can utilize the cheap ores from Latin America and export to those countries as well as to Europe the fabricated iron and steel goods, there is reason to favor the continuance of these conditions. Moreover, since there is little good coal near the largest deposits of iron ore in South America it may never be feasible to establish the manufacture of iron there. The iron ore of that continent will find a market either in Europe or in the

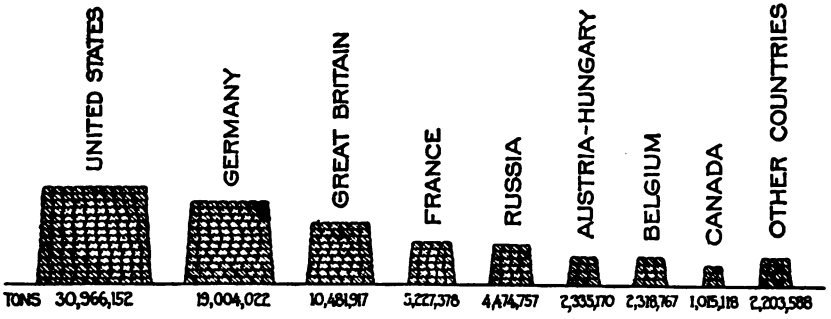


FIG. 2.—World's production of pig iron in 1913.

United States, therefore, whatever is commercially available to the United States should serve a double purpose if sold here, viz., in increasing trade between the United States and South America and in conserving the ore supplies of the United States.

So far as exports of either iron ore or pig iron from the United States are concerned there is little reason for their encouragement.

Twenty-eight States are regular producers of iron ore and several others contain deposits of potential value.

The States in which iron ore occur may be conveniently grouped into six geographic divisions, namely:

1. *Northeastern States.*—Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, and Ohio.

2. *Southeastern States.*—Maryland, the Virginias, Kentucky, Tennessee, North Carolina, Georgia, and Alabama.

3. *Lake Superior States.*—Michigan, Wisconsin, and Minnesota.

4. *Mississippi Valley States.*—Iowa, Mississippi, Missouri, Arkansas, and Texas.

5. *Rocky Mountain States.*—Idaho, Montana, Wyoming, Colorado, New Mexico, Utah, and Nevada.

6. *Pacific Slope States.*—Washington and California.

The Lake Superior division is by far the most important, and it is followed in order by the southeastern division and the northeastern division. The Mississippi Valley and the western divisions are at present of minor importance, although it is certain that at no distant date California and Utah are destined to become large producers of iron ore.

Recent estimates credit the United States with about 7,500 million tons of iron ore of present-day commercial grade, of which about one-third is in the Lake Superior district. The rest of North America, including Newfoundland, Canada, Mexico, and Cuba, is credited with about 7,000 million tons. South America is credited with about 8,000 million tons, and may have more, and Europe with about 12,000 million tons, making a total of almost 35 billion tons of iron ore now known to exist on three continents bordering the Atlantic Ocean. It thus appears that the United States possesses more than one-fifth of this available supply.

Immense as this available supply may seem at first glance it is not sufficient to prolong production for many decades at the rate of increase in consumption of ore that has obtained thus far. The draft on the ore reserves of the Lake Superior district is relatively much heavier than on those of the other districts on account of the possibility of open-pit mining on the Mesabi Range. The Lake district now produces about four-fifths of the iron ore mined in the United States and it has been estimated that if this proportion is maintained the known ore reserves of present commercial grade in the United States portion of the Lake Superior district can not last much beyond the year 1930. Happily, however, there are factors, that, if taken into consideration, indicate the possibility of a considerable prolongation of the life of the Lake Superior iron-ore supplies and of the whole United States, for that matter.

The important factors bearing on the prolongation of the life of iron-ore reserves of the United States may be summarized as follows:

1. The steady accretion to the permanent supply of metal and the consequent reduction in rate of increase of production.

2. Methods of conservation of ore and metal.

3. Imports of ore from Cuba and South America, which must logically be regarded as a portion of the immediately available reserve, since such ores can be used most profitably and economically in the United States.

4. New discoveries of ore deposits.

5. As the price of pig iron increases, lower grades of iron ore will become suitable for use, thus vastly increasing the tonnage of reserves available.

6. Possibility of metallurgical improvements which will enable pig iron to be derived economically from low-grade ores.

7. The utilization of titaniferous iron ores, of which there are large deposits not now available by reason of the metallurgical problems involved.

Interest in this problem has already been awakened. Publications of this department containing estimates of iron-ore reserves based upon geologic field work show that, while relatively great, the reserves are actually limited, and statistical canvasses extending back for many decades also show the phenomenal increases in consumption of ore, so that data are available from which calculations have been made with reference to the life of the deposits.

Bureaus of the Interior Department may further the work of iron-ore conservation still more. Studies should be made bearing upon the decrease of wastage in iron-ore mining, and especially upon the problems of beneficiating iron ore, processes by which enormous supplies of ore of grade too low to be utilized under present conditions, may be made available. Here also is an opportunity for the invention of metallurgic processes by which pig iron may be made commercially from ores of lower grade than at present used, and ores may be smelted electrically in regions where cheap water power is available but good coal is scarce.

It is of interest to note that the discovery of iron ore in the Lake Superior district was made by a United States surveying party in 1844 on what is now the Marquette Range, near the site of the present town of Negaunee, Mich., and that the area of known deposits of iron ore has been greatly extended in this region through geologic surveys conducted by this department.

COPPER.

The production of copper in the United States has increased more than twenty-five fold since 1880. The production in 1913 was 1,652,000,000 pounds, valued at $255,500,000, as compared with a production of 60,480,000 pounds, valued at $12,000,000 in 1880. The world's production of copper is approximately 2,211,000,000 pounds, of which the United States produces 60 per cent, Europe 13 per cent, Canada and Mexico 8 per cent, South America and Cuba 7 per cent, and all other countries 12 per cent.

In 1913 the United States consumed about 41 per cent of the world's output of copper, or about 65 per cent of her production

from native ores, so that in addition to producing sufficient copper for her own needs the United States has been a heavy exporter for many years.

The most important copper-producing districts in the United States are west of the Rocky Mountains in Montana, Nevada, Utah, Arizona, New Mexico, and California. There are two other important districts, namely, Lake Superior, Mich., and Ducktown, in southeastern Tennessee. More than one-half of the copper consumed in the United States is used in the electrical industries; more than one-fourth in the manufacture of brass, and about one-seventh as sheet copper. The largest exports under normal conditions are to Germany, the Netherlands, and the United Kingdom.

One of the most remarkable advances in mining in this country has been in cheapening the cost of handling copper ore. With the advent of the steam shovel, improved mining methods, and recent advances in concentrating the copper minerals of the ores immense low-grade deposits are now worked at a profit. The resulting gain for industry may be perceived from considering what has been done by five copper companies working such ores in Arizona, Nevada, and Utah. These companies have blocked out and thoroughly tested 590,000,000 tons of ore containing 1.7 per cent copper—10,000,000 tons of metallic copper. Of this copper under the present concentrating and smelting methods, about 75 per cent will be recovered. One of the companies is now recovering 79 per cent. Thus the recoverable copper in the ore bodies of these five companies alone is sufficient to supply all domestic needs at the present rate of consumption for nearly 20 years.

Of the total United States production, the five companies mentioned produced 26 per cent in 1913; other Arizona mines, 26 per cent; the Butte, Mont., district furnished 23 per cent; Lake Superior, 13 per cent; and all others, 12 per cent.

At the present rate of production and recovery these five companies have enough ore actually blocked out to continue operations for nearly 50 years. This does not take into consideration the possible development of new ore bodies as work progresses nor the utilization of known ore bodies containing less than 1 per cent copper, which may be made available by more efficient metallurgical processes. Leaching processes for the recovery of copper are now being tried on a large scale and the results obtained indicate a complete revolution in the metallurgy of copper in the near future.

Most of these vast deposits of copper ore were considered a score of years ago too low in grade for profitable mining. At one of these mines previous to 1900 work was being done in a small way and rock that contained 10 per cent or more of copper was considered as

ore; rock of a lower tenor was thrown on the waste dump. To-day at the same mine, through improved methods of mining and milling, all rock with over 0.8 of 1 per cent of copper can be mined at a profit, even with the price of the metal as low as 12 cents per pound.

The present market value of the securities of three of the best known "porphyry coppers," the mines being worked by open-cut methods, is over $175,000,000. If the hands of time were to be turned back to the mining and milling conditions of 20 years ago, these properties would have a value little more than what their plants would bring from junk dealers.

These mines are mentioned not only because they show something of the progress made in mining and milling methods, but because they indicate some of the benefits which the Nation derives from such improvements; for three of these mines alone produce about 300,000,000 pounds of copper annually, worth, at 15 cents per pound, $45,000,000. Under the mining and milling conditions of 20 years ago this wealth of copper remained in the earth. Whoever cheapens and perfects processes for recovering metal from low-grade ores that otherwise could not be mined at a profit not only increases the national wealth by the amount of ore recovered but aids the advance toward international industrial supremacy by supplying cheap metal.

The extraction of copper by hydrogravity concentration has, up to the present, in spite of much elaboration of process, averaged about 70 per cent. This means that in the United States about 340,000,000 pounds of copper went out with the tailings in 1914. If not recovered, this, with copper at 15 cents per pound, means a loss of $51,000,000 per year. Fortunately, many of the copper mills have ponded their tailings, in the hope that the progress of metallurgical knowledge would some day provide methods to rework them. Within the past year or two some of the companies have begun operations on their accumulated tailings piles, using with considerable success "oil flotation" to recover the metal, and one of the largest companies has put in an elaborate plant for separating the copper in the fine sands and slimes and is now leaching its tailings. However, these companies are only making a beginning, and most of the field yet lies virgin to the investigator.

This problem of trying to save $50,000,000 worth of copper each year from tailings piles is one of large importance to the people of the United States; and yet it is only a small part of the mineral-conservation question of the United States.

LEAD.

The production of lead in the United States in 1880 was 98,000 tons, valued at $9,780,000, but in 1914 it had become 542,000 tons,

valued at $42,280,000, an increase of nearly 600 per cent in tonnage and 400 per cent in valuation. The world produces annually about 1,270,000 short tons, to which the United States, the largest producer, contributes about 32 per cent. Spain ranks second, producing about one-half as much as does the United States.

The normal exports of lead about equal the amount recovered from imported foreign ores and base bullion. As the great bulk of the world's lead is mined and smelted outside of Europe, the European war has not affected the supply as it has that of zinc and some other metals. This country's exports of domestic lead were, however, much larger during the first half of 1915, amounting to 58,000 tons against 20,000 tons for the period July to December, 1914.

The lead mines of the United States were not worked at full capacity in 1914, in spite of the output increasing about 90,000 tons. Large stocks and low metal prices caused many large mines to curtail operations during the last half of the year. The increased mine yield resulted in part from larger recoveries of metal by more efficient milling methods.

These large increases in Missouri, Idaho, and Utah occurred notwithstanding the decline in the average price of lead from 4.4 cents a pound in 1913 to 3.9 cents in 1914, the lowest average price in 16 years.

Lead or lead-zinc ores are mined in 22 States, and the fact that the output increased about 80,000 tons regardless of low prices, shows that the United States can supply its domestic requirements for many years, and can also supply a large export demand if prices are favorable or even equal to the average prices for the last 10 years. Most of the lead and zinc ores of the western States carry silver, which adds to their value.

In brief, the lead resources of the United States are capable of meeting consumption, and the production is only limited by the ability of the market to absorb the output from domestic mines and from ore and base bullion imported from Mexico for smelting and refining.

In addition to the ability to produce all the lead required for domestic use, a large part of the output is "soft" lead or lead free from antimony and other metals, which is easily smelted and is specially adapted for use in lead batteries and for making paints and chemical products.

Approximately 40 per cent of the lead produced in the United States is converted into white lead and pigment for use in paints, and is therefore not recovered as metal. About 15 per cent is used in the manufacture of pipes for use in chemical industries and in plumbing, and about 7 per cent is converted into sheets largely for

the lining of tanks and receptacles to contain acids and other corrosive substances, uses for which the metal is peculiarly adapted. About 10 per cent of the production is used in the manufacture of shot, and the remaining 28 per cent is used for various purposes.

The most important lead ore deposits are in southeastern and southwestern Missouri, and northern Idaho. There are also large deposits in Utah and Colorado. About 67 per cent of the lead produced in the United States is from Missouri and Idaho. The deposits in both these States are large, and while some are low grade yet improved metallurgical processes and the use of oil flotation in milling will enable these two States to continue to lead the others for many years to come, and to make the United States absolutely independent of foreign countries for the lead it needs.

ZINC.

The world's output of spelter or metallic zinc in 1913 approximated 1,094,000 short tons, of which the United States produced 31.7 per cent. The domestic production, which was higher than that of any other country, was practically all consumed within the United States. The production of zinc in 1880 was 23,240 tons, and in 1913 the total domestic production was 337,000 tons, slightly more than 9,000 tons being produced from foreign ores. The average consumption of spelter for the last 6 years has been about 331,000 tons annually. Since 1880 the zinc output of the United States has increased over 1,500 per cent. Of the total amount produced in 1913, 17,700 tons were exported to Europe. In 1913 Germany and Belgium produced nearly one-half of the world's output of zinc, a larger part from imported ores. The independence of the United States with reference to its zinc supplies, is shown by the fact that from January to June, 1915, more than 64,000 tons of spelter was exported as compared with 824 tons during the corresponding half of 1914. The production of spelter during the last half of 1914 was 178,000 tons as compared with 216,500 tons during the first half of 1915.

The ability to produce spelter is only limited by the capacity of smelting plants, and the high price of zinc has caused all the old coal-fired smelters in Kansas and Missouri to resume operations and has increased the number of retorts in use from 113,914 at the close of 1914 to 130,642 on June 30, 1915. Additional retorts are contemplated and under construction to the number of 34,000, so that within a few months the zinc smelting capacity will be nearly 50 per cent greater than at the end of 1914.

Ores of zinc are so widely distributed that to supply this increased smelting capacity will cause no shortage of ore. Nineteen States

shipped zinc ore in 1914 and about 40 per cent of the spelter produced that year came from ore mines in the Joplin region, in Missouri, Oklahoma, and Kansas. Montana is the second largest producer of zinc ores and large shipments are made from Colorado, Wisconsin, New Jersey, and New Mexico. Tennessee and Arkansas also are producing large quantities of high-grade ores. With zinc concentrates selling at $50 to $60 per ton, many mines in the Joplin region can mine ore that yields 2 to 2¼ per cent of concentrates. Wisconsin, Alabama, Oklahoma, and other Central States can and will largely increase their output of ore, and the improved methods of concentrating the ore and the higher prices for concentrates will make available large quantities of ore from the Western States.

In the Joplin district, Missouri, about 14 per cent of the ore was left in the mines as pillars. In the West, owing to the cost of treatment and freight charges much low-grade ore is left in the mine, but is not necessarily completely lost unless the mine is wrecked. Except in the New Jersey mines, where conditions are unique, it is probable that less than 50 per cent of the zinc, even in those mines where zinc is the only product, reaches the form of spelter. Zinc mining is frequently done on a royalty basis, an arrangement that means great waste, because the lessee naturally takes out the ore paying the greatest profit and leaves the poorest ore behind. Not only are there enormous losses of zinc in mining, milling, and smelting, but the losses continue in the utilization of zinc, especially in the manufacture of brass. It has been estimated that 15,000 pounds of zinc escape daily up the stacks of the rolling mills in one city in Connecticut.

In concentrating the losses are enormous. In many mills not less than 40 per cent of the metal shown by assaying the ore is lost. From 30 to 35 per cent is perhaps an average loss. In smelting zinc ores the loss is heavier than in smelting any other metal; the average is probably 15 per cent of the assay value.

Lower royalties, better concentration works, and obligatory storage of tailings will help to lessen concentration losses. Further metallurgical improvements are most urgently desirable.

Some 40,000,000 pounds of zinc oxide is used annually for filling in automobile tires, and the remainder of the 60,000 tons now produced annually in the United States is used chiefly in paint. In neither instance is the zinc ever recovered. Dirty foundry scrap, as well as the concentrates from the ashes of crucible furnaces and from molder's sand, are generally worked up in the recovery of copper, the zinc contained, roughly estimated as over 2,000,000 pounds per year, being a total loss.

The annual waste of metals, chiefly zinc, in brass-furnace practice amounts to more than $4,500,000. Two million dollars a year of

preventable loss may easily be saved by bringing average practice up to best practice.

In foundry practice it is easy to catch the zinc oxide from the present form of melting furnace, but unless petroleum or gas is used as fuel the oxide caught is so mixed with foreign material as to be worthless, except possibly for making zinc chloride for impregnating timber.

ALUMINUM.

The consumption of aluminum in the United States in 1914 was the largest on record and amounted to 79,129,000 pounds, valued at $14,523,000. Sixty years ago aluminum was a chemical curiosity, valued at $90 per pound. The total amount produced in 1883 was 83 pounds. About 1889 it was selling in the United States at $4.50 per pound, and the output was 75 pounds per day. With cheapened electric power and improvements in manufacturing processes, due to the genius of men like Charles M. Hall, the metal has ceased to be a "chemical" and its uses and applications are growing. At the end of 1914 it was selling at 19 cents a pound, but now, owing to the great demand, it is worth 35 to 37 cents a pound.

The consumption of metallic aluminum in the United States is much greater than the output and, though some metal is exported, a much larger quantity is imported. Much secondary aluminum is recovered from one source or another, largely from scraps, borings, and turnings. This recovered aluminum amounted, in 1914, to 6,253 short tons, or 12,506,000 pounds. The consumption of the metal is growing rapidly and the facilities for turning out enough for home consumption are inadequate. The one concern manufacturing the metal in the United States has steadily expanded its plant capacity in recent years, and has recently acquired an immense plant capable of generating 100,000 horsepower at Whitney, N. C., financed by French capital, but on which work had been suspended.

The great increase in the consumption of metallic aluminum has been determined by the peculiar properties of the metal, especially its lightness. Commercial aluminum has a specific gravity of about 2.7, whereas the specific gravity of brass is about 3 times as great, that of steel about 2.8 times as great, and that of copper approximately 3.3 times as great. Hence the metal has been in demand in the manufacture of automobiles, aeroplanes, and dirigible balloons.

Aluminum vessels are coming into use in the brewing industry, varnish manufacture, the preparation of foodstuffs, the soap and candle industry, the refining of sugar and fatty and vegetable acids, and in the manufacture of high explosives, because of its ability to withstand the action, either separately or combined, of sulphuric and nitric acid.

Aluminum can be said to have no substitute, but is growing in importance as a substitute for copper for conducting electricity, and also as a substitute for tin in certain applications. When one considers the multiplicity of uses to which aluminum is now applied and the part that it is destined to play, the question of the domestic supply of bauxite, the mineral from which the metal aluminum is now made, assumes importance.

Bauxite.—The domestic production of bauxite, the mineral from which all our metallic aluminum is now obtained, was over 219,000 long tons, valued at slightly over $1,000,000, in 1914, the largest on record. The imports were nearly 25,000 long tons. Our total consumption of the ore, therefore, was 244,000 long tons, of which the imports were slightly more than 10 per cent. These imports come from France, which is the most important producer. The United States ranks second, and of late years has rapidly gained on France.

Productive bauxite areas are confined exclusively to the Southern States, Arkansas, Tennessee, Georgia, and Alabama. The State of Arkansas has for many years produced more than 80 per cent of the bauxite mined in this country. The remainder comes from northwest and central Georgia, northeast Alabama, northeast and southeast Tennessee. It is reasonably certain that as time goes on more of this important mineral will be found in east Tennessee, as well as in north and central Georgia.

Bauxite has other uses than as the ore of aluminum: (1) as the base of salts, of which the alums, including aluminum sulphate, are the most important, aluminum sulphate, commonly referred to as "commercial alum," being used widely in the purification and clarification of municipal water supplies; (2) in the manufacture of alumina, or bauxite brick; (3) in the manufacture of artificial abrasives, one being alundun, which may be termed artificial corundum.

There are at present no substitutes for bauxite for use in making aluminum, although the preparation of potash sulphates from alunite deposits in Utah may result in the production of important quantities of alumina in such pure form that it will be available without further treatment. Another prospective source of alumina is ordinary clay, but although experiments have been in progress some years no process for obtaining alumina from clay has yet reached the commercial state. As common clay contains 10 to 39 per cent alumina the development of a commercial process warrants all the attention that can be given it.

So far as our present resources are concerned, we may consider the United States as practically independent, especially as new bauxite occurrences may be found, and American inventive genius may be trusted to solve the problem of extracting the metal from clay or some other alumina compound.

The plant required for manufacture of metallic aluminum is extensive and costly, so that at present this country is dependent on foreign sources for a part of its supply of metal. The new plant in North Carolina will help matters somewhat, but aluminum plants can not be built in a day, and they require large electric-power installations.

MANGANESE.

Manganese is one of those elements of vital importance to the basic industries of the United States which probably can not be completely supplied from domestic sources under present commercial conditions. Prior to 1870 iron found its principal use as wrought iron and crucible steel in which manganese is not used. The development of the Bessemer process about 1870 created a demand for manganese alloys, and manganese now constitutes about one-half of 1 per cent of all Bessemer and open-hearth steel. Manganese also forms a large part of some special alloys used in the manufacture of grinding and crushing machinery that are highly important in modern industries. Several chromium alloys may be substituted for manganese in such machinery, but the supply of readily accessible chromium ores in the United States is also deficient.

Manganese deposits have been worked in a number of States, notably Virginia, Georgia, Arkansas, Colorado, and California, the production in 1880 being 5,760 tons, valued at $52,000, and in 1913, 4,050 tons, valued at $40,000. The average production since 1880 has been 11, 000 tons a year and the average importation since 1890 has been 164,000 tons a year, which has been derived almost entirely from India, Brazil, and Russia. In addition to the imports of manganese ore, large tonnages of the alloys, ferromanganese and the lower-grade spiegeleisen, have been imported, averaging 71,000 tons and 36,000 tons a year, respectively, for the 14 years, 1901–1914, inclusive. The sources of these alloys are not recorded in detail, but until recently England appears to have supplied practically all of the imports.

In addition to deposits of manganese ore proper, deposits of lower-grade manganiferous iron ores are now exploited in several States, notably New Jersey, Virginia, Arkansas, Michigan, Minnesota, and Colorado. Spiegeleisen is made from a part of these.

There is no doubt that a higher price, which would be caused by the elimination of several sources of imports, would stimulate production from domestic mines, but it is doubtful whether extraordinarily high prices would bring forth a regular production of more than 20,000 to 25,000 tons of manganese ore a year. For only three years has the domestic production exceeded 25,000 tons a year. With higher prices the tendency would be toward greater use of

the manganiferous iron ores, of which there are large deposits, but ferromanganese has largely displaced the older product, spiegeleisen, which is made from the low-grade ores, so that a readjustment in processes would have to take place.

In 1898 it was estimated that the probable yield of the Russian deposits would be 80,000,000 tons, sufficient at the present rate of production to last about 80 years. In 1908 it was estimated that the better grades of ores in the known Indian deposits would probably last 30 to 40 years. No accurate estimate has been or probably can be made for the Brazilian deposits, but it may be said that they are enormous, and as yet are almost untouched. Considering the wide distribution of manganese deposits in general and certain relations of the deposits, there is reason for assuming that there remain in the tropical belts of Africa and South America undiscovered deposits of manganese ores that will be important sources of supply in the future. A number of important deposits are now known in these regions that can not be worked on account of lack of transportation facilities.

In contrast with most foreign ores, practically all of those in the United States must be washed, and in this process the losses of fine ore are high. These losses can be overcome, but the prices paid for the product do not warrant the increased expense. There are losses in the slag and dust in the blast furnace, as well as by volatilization, which range from 15 to 30 per cent. Unfortunately the losses are greater when the electric furnace is used.

A review of the American industry for the period of 14 years, 1901–1914, shows that out of the total manganese as ores and metal needed by all industries, most of which are fundamental and can not consider a substitute, only about 8 per cent has been derived from the various domestic sources. It would seem that there is an excellent opportunity for United States capital to develop the Brazilian deposits, if for no other reason than to be in a position to furnish that Republic with the necessary supply of iron and steel for the railways which it will require in developing its agricultural resources and the exploitation of its vast forests.

CHROMIUM.

Although the salts of chromium have many minor uses, the metal finds its greatest use as an alloy with iron in the manufacture of high-grade steel for the most part uniquely adapted to special uses. Tool steel containing small amounts of chromium and tungsten permits a rate of cutting not possible with any other alloys and is therefore important in modern machine-shop practice.

The mineral chromite, which is the source of all salts and alloys of chromium, has been mined in Maryland, Pennsylvania, North Carolina, and California. The average production of chromite for the 13 years, 1901–1913, has been 250 tons per year, whereas for the same period the imports have averaged 39,000 tons each year. In addition large quantities of chromium alloys and salts are imported. There are important deposits of chromite in Rhodesia, New Caledonia, Russia, and Turkey, and the American imports come principally from Rhodesia and Turkey.

As deposits of chromite are usually irregular and of uncertain extent little ore is developed in advance of mining, and it is impossible to foretell either the early exhaustion of a deposit or the discovery of new deposits. Thus, although for some years the Turkish deposits were the most important source, their production is now greatly exceeded by that of Rhodesia. A slight increase in price might stimulate the domestic production of chromite, but there is great doubt whether the present demand can be supplied from the known deposits in the United States. If foreign ore were unobtainable much larger quantities would be mined in this country, especially in California.

THE RARER METALS.

Many of the minor or rarer metals, although showing only a small tonnage or money value when compared to the huge output of iron, copper, etc., have a greatly disproportionate importance in their relations to the industries of the country, human comfort, or even the destruction of human life, and although none of them are indispensable, their lack would in some directions cause the wheels of progress to turn backward for a short space.

A very important group of the rarer metals, known as the steel-alloying metals, includes chromium, cobalt, nickel, tungsten, vanadium, and of less importance, molybdenum and titanium. By the use of these metals wonderful alloy steels containing six or seven metals have been evolved, the "high speed" steels, by the use of which one man now does as much work with metal-cutting machinery as could formerly be done by five men, as shown in fig. 3.

These alloy steels have been largely though not wholly developed in the United States. The tremendous quantity of special steel ordered in this country by the warring nations has shown the extreme importance of the steel-alloying metals and prices have increased by leaps and bounds.

The alloy tool steels are now sold as high as $2 and $3 a pound as compared with 50 to 60 cents a pound formerly, and meet no competition from the fine carbon tool steels formerly used. For carbon

steels with established reputations between 10 and 20 cents a pound was considered a good price.

For the "high speed" tool steels, chromium and tungsten are essential; vanadium, cobalt, and molybdenum desirable. Tungsten and vanadium can be produced in this country easily, at least for present demands; molybdenum, chromium, and cobalt for at least a portion of our needs.

Alloy steels of simpler composition are used in many forms of machinery with great benefit. All shoes and dies in stamp mills and the tires of rolls used in crushing ores are made from steel containing chromium. Many of the best automobile axles and springs, locomotive frames and springs, and other machine parts that must stand hard usage and which must be reliable are made from steels carrying vanadium or chromium and vanadium. For these uses it would

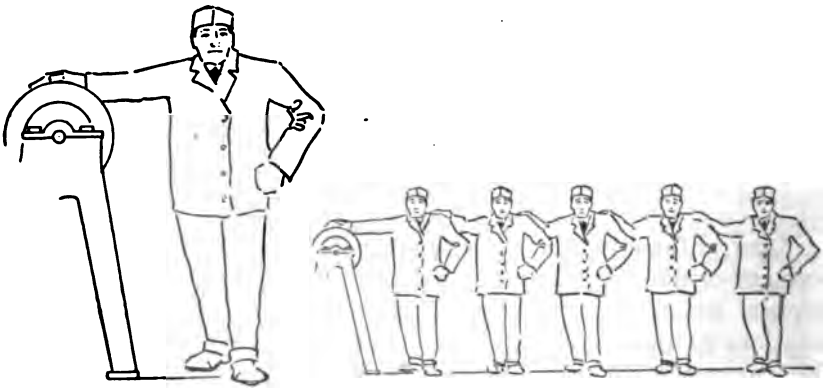


FIG. 8.—One man with one metal cutting machine, equipped with tungsten "high speed" steel tools, can now do as much work as could five men with five machines equipped with the carbon steel tools formerly used.

be difficult to obtain sufficient chromium in this country, but there would be no great difficulty in producing substitute steels. The vanadium could probably be mined from various deposits in Colorado, New Mexico, and Arizona.

Uranium is used in the manufacture of special steels and some of its salts are used for coloring glass, but the element is chiefly notable from its being the parent of that wonderful element radium which promises to be of very great importance in the treatment of disease. Through the cooperative efforts of the Federal Bureau of Mines and the National Radium Institute radium is now being manufactured on a commercial scale from the carnotite ores of Colorado at a cost one-third the price asked by foreign producers of radium. This triumph of American invention and skill is not only making this country independent of foreign sources of supply but is enabling

American physicians to apply to the cure of cancer and similar diseases radium in quantities not available to physicians in Europe.

Nickel steels containing about 3.5 per cent nickel are extensively used in automobiles and other machines and in armor plate. The United States has no known large supplies of nickel ores, but substitutes can be provided. The imports amount to about 47,000,000 pounds per year, valued at $6,500,000, 94 per cent of which is from Canada and the remainder is from New Caledonia. About 29,000,000 pounds are exported, leaving 18,000,000 pounds as representing domestic consumption. About 400 tons of nickel is produced from the refining of domestic and foreign blister copper and other ores.

Of titanium, also used in steels, the United States has in the rutile deposits of Virginia the largest available supplies of titanium dioxide known in the world. In addition to this there are millions of tons of titaniferous iron ores in the United States from which it will be possible to obtain titanium, especially for the manufacture of an alloyed steel.

Besides the use of tungsten in steel, in which it is saving millions of dollars a year in wages, it is saving other millions of dollars to consumers of electric light. Incandescent lamps with tungsten filaments are now made which consume only about five-tenths of a watt per candle, against 3.5 watts per candle used by the carbon filament lamp of 10 years ago, so that now one may have for 15 cents as much electric light as he could get 10 years ago for $1, and of much better quality (fig. 4). The production of malleable tungsten has made possible such lamps, and the development of malleable tungsten from the practically infusible powder, in which form only tungsten was before known, was accomplished in this country by the scientists of the General Electric Co. Tungsten in intermittent electric contacts is replacing platinum and is in many places better than platinum, and this, with the use of nickel-chromium resistance wires, is probably responsible for a drop in the price of platinum.

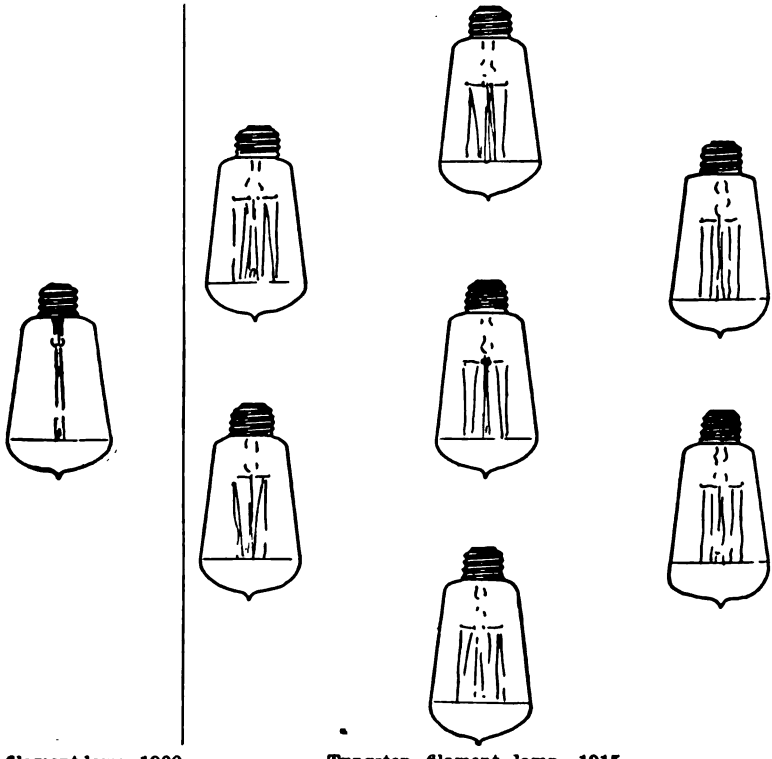
The United States has sufficient supplies of tungsten for its use, though so long as cheaper ores can be obtained abroad they will be imported unless stopped by artificial means, as by a tariff.

The principal tungsten deposits are in Colorado, California, Idaho, New Mexico, Nevada, and South Dakota. Many of the new discoveries are not sufficiently developed to show how large an output can be made from them. The world's production amounts to 9,500 tons per year, of which the United States produces more than 1,500 tons. Burma, Portugal, Argentina, Queensland, and Japan are other important producers in the order named.

Exact figures showing imports of tungsten are not available, as they are reported as tungsten, ferrotungsten alloys, and tungsten ore.

The United States is also deficient in tin supplies, but substitutes, such as lead, zinc, and aluminum can probably replace it in practically all cases without great inconvenience.

The United States consumes more tin than any other country in the world and at the same time produces practically none. Small deposits of tin have been found in California, Idaho, South Dakota, Washington, Wyoming, Texas, South Carolina, and Alaska. The latter has in recent years produced some tin, averaging 100 tons per year the past three years, and is worthy of further development.



Carbon filament lamp, 1900. Tungsten filament lamp, 1915.

FIG. 4.—Comparative quantities of electric light obtainable for the same price from the carbon filament lamp of 15 years ago and the tungsten lamp of to-day.

The United States, however, imports practically all of its tin from the Straits Settlements, Bolivia, and England. Bolivian ores have been sent to Europe for reduction on account of lack of fuel in Bolivia. The smelting of Bolivian ore has been successfully performed in this country, and there seems no reason why it should not be done on a large scale, since the opening of the Panama Canal will furnish low freight rates. A tin smelter has been established at tidewater in New Jersey. The total quantity of tin imported for

consumption in the United States amounts to nearly 58,000 tons per year, valued at more than $50,000,000.

There are a number of plants in operation in the United States for the recovery of tin from various sources, such as the detinning of cans, and the recovery of tin in babbitt, bronze, solder, and electrotype metal. The amount so recovered equals about 15,000 tons per year, valued at more than $14,000,000.

The demand for antimony caused by the European war has resulted in the opening of many deposits. The element is almost indispensable in type and bearing metals, and there has been a great demand for antimony to be used in making shrapnel bullets; antimony is thus a metal that lends itself to the perpetuation of the noblest endeavors and at the same time may be used in instruments for destroying men. It has been mostly obtained from China and Mexico, but in this country sufficient supplies for our needs are obtainable, though at somewhat higher costs.

Of other of the rarer elements, arsenic, bismuth, selenium, etc., this country can develop supplies sufficient for any needs now apparent.

RARE EARTHS.

Comparatively little is known about a large number of the rarer elements of which the earth is composed. Even the minerals that contain them are little known and it is impossible to state how extensively they occur in the West, for they may have been overlooked as worthless. This assumption is especially true of such elements as tantalum, columbium, thallium, thorium, beryllium, and the 20 or more elements of the cerium and yttrium earths. No one can say what an exploitation of this field might lead to, but it is through pure scientific investigation of such problems as these that many industries have been developed, perhaps the most noteworthy being that of the Welsbach gaslight mantle. In the production of thorium from monazite, by far the larger part of the associated materials go to waste. About 30 per cent of this waste is cerium and the remainder lanthanum, neodyminum, praseodymium, and other rarer elements of the rare earths. There is every prospect that the cerium will soon be utilized and bring a fair price. The separation of the element from the other earths is no longer difficult and, once the element is in solution, can be brought about in a single operation, and the metal can be readily reduced by the electric current. The properties of the metal in alloys, some of which have most remarkable pyrophoric properties, are now well known. It is also probable that cerium oxide, lanthanum oxide, and the oxides of other rare earths that occur in these waste materials will become of special value as refractories, for they are among the most infusible materials known.

Cerium is also finding use in the form of cerium fluoride in the flaming arc, and there is little doubt that this use may be greatly extended. The properties of some of the compounds of cerium to act as perhaps the strongest oxidizing compounds known may open up new uses for this metal.

NONMETALS.

FUELS.

COAL AND COKE.

One fact about our mineral resources that is pretty generally known is that our coal reserves are immense—hundreds of millions of tons—and that the high-grade coal is in the East and the low-grade coal is chiefly in the West. Although we are the largest consumer of coal in the world, using nearly 40 per cent of the total

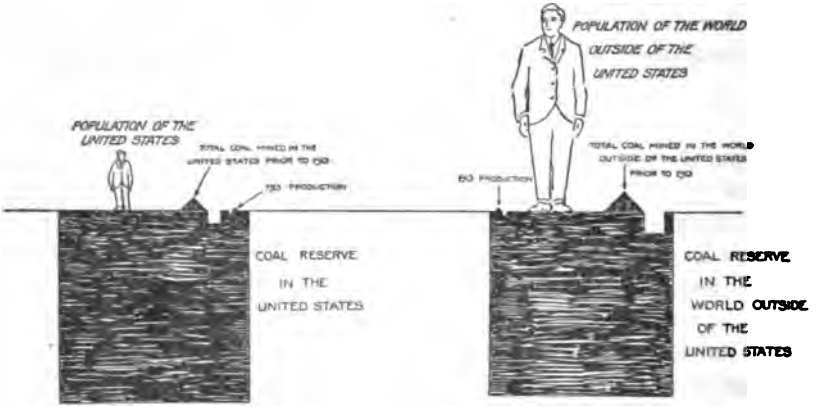

POPULATION OF THE UNITED STATES
TOTAL COAL MINED IN THE UNITED STATES PRIOR TO 1913
1913 PRODUCTION
COAL RESERVE IN THE UNITED STATES
POPULATION OF THE WORLD OUTSIDE OF THE UNITED STATES
TOTAL COAL MINED IN THE WORLD OUTSIDE OF THE UNITED STATES PRIOR TO 1913
1913 PRODUCTION
COAL RESERVE IN THE WORLD OUTSIDE OF THE UNITED STATES

FIG. 5.—Coal reserves and production in the United States compared with the remainder of the world.

world's production, we have as yet consumed but one-half of 1 per cent of the total quantity the geologists estimate as present in the United States. The comparative coal reserves of the United States and the rest of the world are graphically indicated in fig. 5.

The annual production of coal in the United States has increased over 800 per cent in 35 years—from 68,000,000 short tons in 1879 to 570,000,000 short tons in 1913. The total value at the mines of the coal produced in 1913 was $760,000,000.

Comparatively speaking, we figure only in a small way either as importers or exporters of coal. Our coal imports in 1913 amounted to 1,500,000 tons, mainly from Canada and Australia. The exports in 1913 amounted to 25,000,000 tons, about 4 per cent of the output, Canada receiving the largest tonnage. Great Britain ranked second as a coal producer in 1913, with 322,000,000 tons, of which 36 per cent

was exported. Germany follows with a production of 290,000,000 tons, of which 9 per cent was exported.

The public-land States in the West contain the largest reserve of bituminous coal, both high and low grade, and of lignite in the world. Nearly half of this reserve is yet in public ownership. In the public-land States it is estimated that there are 100,000,000,000 recoverable tons of bituminous coal and lignite in beds of sufficient thickness and near enough to the surface to be profitably mined under present commercial conditions and many times that amount in thinner beds and at greater depths that can not be profitably mined at present.

So great is our use of coal and so large is our annual coal bill that consumers are constantly striving to obtain the largest measure of heat possible from their coal. This is being accomplished by the development of improved boilers and furnaces which permit the use of lower-grade coal, by the use of producer gas, and by the use of powdered fuel. The progress made in the use of coal in the last five years along mechanical and metallurgical lines is nothing short of remarkable.

If need be, the United States can supply the world with coal. The supply of coal is here, and undoubtedly the capital, labor, and transportation facilities will be forthcoming if the price of coal rises sufficiently to warrant their use for this purpose. But it is to be hoped that the great bulk of our coal will be utilized at home in the upbuilding of our industries.

In the past there has been great waste in the mining, transportation, and use of coal in the United States. Much of the mining in the past 50 years was carelessly done, and a large quantity of coal was left in the ground in such a manner that the possibility of its future recovery is problematical. Unscientific mining is not entirely to blame, for under the press of widespread and unregulated competition, mine operators have been under the necessity of getting the coal out of the ground at the least cost and without proper regard to high recovery and conservation. The apparent limitless extent of our coal reserves has made us prodigal in our waste of them. Coal is cheap in this country, and not until we put a higher value on it will proper attention be paid to its conservation in the ground.

During each year for every 500,000,000 tons of coal produced we waste or leave underground in such condition that it probably will not be recovered in the future at least 250,000,000 tons of coal. This represents an average recovery of 66 per cent. In some cases the recovery in former years has not exceeded 30 per cent of the contents. However, under the best current practice with improved mining methods some mines are now recovering 85 to 90 per cent.

It is estimated that since coal mining began in this country fully 2,000,000,000 tons of anthracite and 3,000,000,000 tons of bituminous coal have been left in the ground under conditions that make future recovery highly improbable.

Probably not over 11 per cent of the energy in coal is effectively utilized. The remainder of the energy is lost through the inefficiency of the steam boiler, the steam engine, and the electric dynamo. It is estimated that the boiler scale in locomotives alone in this country means a loss of over 15,000,000 tons of coal annually. It has been shown that one-sixteenth of an inch of scale means a loss of 13 per cent and that one-eighth inch, an amount present in many boilers, means a loss of 25 per cent in boiler efficiency. Careful study of boiler practice has greatly increased boiler efficiency, but, although 80 per cent efficiency is obtained in boiler tests under careful chemical and technical control, not above 50 per cent is obtained in average practice.

Loss in coking.—Nearly three-fourths of our coke (33,584,000 short tons in 1913) is made by the wasteful beehive process. Slightly over one-fourth (12,714,000 tons) is manufactured in ovens of the by-product type that permits recovery of gas, tar, ammonia, benzol, and other products. For example, in 1913 69,240,000 tons of coal were charged into coke ovens, yielding about 46,300,000 tons of coke. Roughly, therefore, 23,000,000 tons of the richest part of the coal were driven off. In a single year the beehive coke ovens turn into the atmosphere more than 100,000,000,000 cubic feet of valuable gas, which, if properly treated, will yield not only gas but other important carbon by-products.

The total value of the by-products from the retort-oven coke was $16,925,941. If it is assumed that the coal coked in beehive ovens was similar to that coked in retort ovens, and the prices obtainable for recoverable by-products would have been the same, the value of the recoverable products wasted that year amounted to $45,000,000, or nearly 80 per cent of the value of the coal actually used in beehive ovens.

The United States imported coal-tar products in 1913 to a value of $10,000,000. No exports are recorded.

The demand because of the European war for chemical derivatives of coal tar for dye and explosive manufacture has stimulated the construction of by-product ovens. At the end of 1913 there were 5,688 ovens; at the end of 1914, 5,809; and it is estimated that at the present date (September, 1915) the total of these ovens constructed and under construction is not less than 7,000. Many of the by-product coke establishments that prior to the war were not equipped to recover benzol and other chemicals are now equipped to save these valuable substances.

Another source of waste to which attention should be called is the coke breeze. In the coke regions where the old methods are used, however, the coke breeze lies in immense piles, unless, indeed, it is burned as fast as made, and a considerable portion of the coal originally used goes to waste in this manner. Now, it is well known that this breeze, often brought into the market for domestic purposes and known as "crushed coke," makes excellent fuel for hot-air furnaces in residences; yet in the regions where it is made no one seems to think it worth while to take advantage of fuel that could be had for the mere carting. Coal evidently is still so cheap that the need of a substitute is not felt.

Anthracite.—In the supply of anthracite coal, the United States stands alone. The supply of this valuable fuel, valued because of its cleanliness both in handling and use, is limited. At the present rate of consumption, which is apparently nearly at its maximum, the amount of anthracite yet unmined is not expected to suffice for our needs for more than 75 years. Anthracite is a luxury. As a clean domestic fuel, coke, coal gas, and electricity may be expected to largely replace it in the years to come. We export nearly 5,000,000 tons of anthracite annually, over three-fourths of which is consumed by eastern Canada.

One of the efficient methods of conserving our coal supplies is through the utilization of water power. Furthermore, the development of the gas engine, by means of which energy of fuel can be utilized without the intermediary loss involved in generating steam, is rapid. This development has the distinct advantage that much coal too poor in carbon content to be economically transported can be readily burned in gas producers and its energy transmitted to a distance through the gas engine and the dynamo. The covering of pipes with asbestos and magnesia coatings and the scientific control of the combustion of coal under boilers are greatly increasing the amount of energy actually utilized, but the losses of carbon that is still pouring from our chimneys, defacing monuments, buildings, and landscapes are without justification.

PETROLEUM.

The marketed production of petroleum in the United States in 1914, including a small amount contributed by Alaska, amounted to 265,700,000 barrels of 42 gallons each, this output being valued at $214,000,000. Thirty-five years ago, or in 1879, the total output credited to the United States was 19,900,000 barrels, valued at $17,200,000.

Available statistics indicate that since 1859, the year in which petroleum was first produced commercially in this country, the United States has produced and marketed up to the end of 1914 a

total of 3,335,000,000 barrels of petroleum, representing 60 per cent of the entire petroleum production of the world from 1857 to 1914, inclusive.

The world's production of petroleum in 1914 is estimated at 400,500,000 barrels, of which the United States furnished 66 per cent.

Imports of petroleum and petroleum products for consumption in the United States were practically negligible until 1911, when the importation of crude petroleum for fuel purposes from Mexico began to assume significant proportions. Prior to then the most significant imports were those of gasoline from Borneo to the Pacfic coast to supply a deficiency caused by the demand for automobile fuel. The recovery of gasoline from casinghead gas, an increased supply of the lighter refining oils, and the improvement in refining processes have increased the supply of motor fuel in California and imports of gasoline now of no consequence.

The total value of crude petroleum, petroleum products, and ozokerite, a natural paraffin wax, imported for consumption in the United States in 1914 amounted to $12,300,000; the imports of crude petroleum, mainly from Mexico, were 17,200,000 barrels, valued at $11,500,000, or 93 per cent of the value of all imports. Of the remaining 7 per cent, the value of the ozokerite imports is slightly more than that of the paraffin oil and paraffin wax. The United States exports far more paraffin oil and paraffin wax than it imports, so that the country is obviously independent of foreign supplies of these refined products. Also in Utah are undeveloped ozokerite deposits ample to supply the domestic requirements for this substance, so that its importation is merely a matter of convenience.

The situation with regard to fuel-oil need is essentially similar.

Exports of crude petroleum and residuum for use mainly as fuel exceed in value the imports of fuel oil from Mexico, the ratio in 1914 being nearly 2 to 1 in favor of the United States. Under existing conditions it is cheaper and more convenient to import Mexican fuel oil for use along the Atlantic seaboard than to bring it from California and Gulf coast ports. Furthermore, there is plenty of coal at hand to supply any possible deficiency of liquid fuel, so that the United States is independent of foreign fuel.

The total exports of crude petroleum and liquid products of petroleum, exclusive of waxes, greases, etc., amounted in 1914 to 16,700,000 barrels of 42 gallons each and had a declared value of $140,000,000.

Exports of crude petroleum were mainly, in order of magnitude, to Europe and Canada; of gasoline, to Europe, adjacent North American countries, and South America; of naphtha, to Europe, adjacent North American countries, and Asia; of illuminating oil, to Europe, Asia, South America, Oceanica, Africa, and adjacent

North American countries; of lubricating oil, to Europe; of gas and fuel oil, to Europe, adjacent North American countries, South America, and Africa; and residuum to adjacent North American countries.

The known areas of productive oil land in the United States comprise six districts, as follows: (1) On the west flank of the Appalachian Mountains, from southwestern New York to northern Alabama; (2) in northwestern Ohio and eastern Indiana; (3) in southeastern Illinois; (4) in southeastern Kansas, northeastern Oklahoma, northeastern Texas, and northwestern Louisiana; (5) in southeastern Texas and southwestern Louisiana; and (6) in the southern half of California. In addition, there are relatively small areas of productive oil land in east-central Colorado and various parts of Wyoming.

The total area held in fee, leased, or on which oil rights are claimed in these various fields, including contested portions of Federal petroleum reserves, amounted at the end of 1914 to approximately 9,800,000 acres, or about 15,300 square miles. Of this total area perhaps 20 per cent, or 3,060 square miles, was actually developed at the end of 1914. Careful estimates made by the Geological Survey in 1907 placed the area of prospective oil land in this country at 8,450 square miles. On this basis, approximately three-eighths of the total area of oil land in this country is under development. Assuming that the yield of oil from the undeveloped area plus that contributed by the declining wells of the area already developed will be proportional to the quantity of oil already obtained, a fairly conservative assumption, then the reserves of petroleum in the United States amount at present to approximately 5,560,000,000 barrels. At the present rate of consumption and export, which is, roughly, 250,000,000 barrels a year, the available supply of petroleum would be exhausted in about 23 years, or about the year 1937. Probably, however, although the annual production may increase temporarily through developments in Oklahoma, California, and Wyoming, there will be a marked decline within a very few years. This decline, the higher prices for petroleum and petroleum products, more efficient utilization, and the prevention of much waste will prolong the life of our oil fields for many years.

Vast deposits of oil shale in Utah and Colorado, which can furnish 10 gallons to 60 gallons per ton of rock, constitute an enormous undeveloped reserve of petroleum, the value of which can not be estimated from present data. Attention was first directed to this latent source of petroleum by the Geological Survey in 1901, and investigations are being made by the Survey and the Bureau of Mines to determine the extent and value of this reserve.

From the crude petroleums are obtained products that are indispensable, one of these being lubricating oil and another is kerosene, needed for the lighting of isolated houses and all buildings that can not obtain gas or electricity at reasonable cost.

Gasoline, another product, is almost universally used in this country as motor fuel and may be regarded as necessary, though numerous efficient substitutes are available at higher prices. The Diesel type of engine, which burns either vegetable or mineral oils, also suggests how a scarcity of gasoline may be met.

Some unnecessary and wasteful uses of petroleum are as follows: Burning it under steam boilers, the most obviously unnecessary use; oiling roads, coal-tar residues being equally efficient; and making oil asphalt. The last use, though desirable, is unnecessary, because deposits of native bitumen and asphaltic rocks are available in Utah, California, Texas, Oklahoma, and elsewhere.

The growth of the petroleum industry in the United States has been accompanied by the invention of new processes and devices and the improvement of old ones, making the industry notable for the introduction and development of distinctly American features. Some of these features are the perfecting of the cable rig, a chisel-shaped bit suspended by a rope, that has probably been tried in every oil field in the world, the rotary rig developed in the Gulf field and since used in California, Roumania, and Russia; the construction of pipe lines hundreds of miles long, connecting the wells with refineries and shipping ports; the invention of processes for refining oils of unusual composition; the perfecting of processes by which the percentage of gasoline obtainable from a crude oil is greatly increased; the production of gasoline from natural gas; and the manufacture of toluol and benzol from petroleum.

Some of the wastes in the petroleum industry are enumerated here: Careless methods of drilling and casing wells, whereby oil and gas are wasted, wells get beyond control or run "wild," and productive sands are ruined by water; production in excess of immediate marketing facilities and demand; storage in earthen sumps or open tanks, with resulting loss by seepage or evaporation; fires from lightning or other causes, which have caused enormous losses of stored oil or oil from flowing wells.

Some of the substitutes for petroleum are as follows: For illuminating purposes; acetylene gas, water gas, coal gas, animal fat or vegetable oil, or alcohol from grain, potatoes, and waste products; for motor fuel; alcohol, benzol, or vegetable oils in Diesel engine; for fuel oil; coal, coke, lignite, wood, and charcoal; and for lubricating oil; no efficient substitute known.

NATURAL GAS.

The quantity of natural gas commercially utilized in the United States in 1914 is estimated to have amounted to 592,000,000,000 cubic feet, valued at more than $94,000,000. In 1885 the value of the natural gas utilized in this country was estimated at $4,857,000.

Productive areas correspond fairly closely in distribution with the petroleum fields, except in California, where the commercially utilized production is obtained mainly from the Buena Vista Hills division of the Midway field in Kern County.

Probable areas lie in extensions of the present productive fields either areally or deeper. Natural gas resources far in excess of present demand within the limits of transport are known to exist in the Healdton, Loco, and Duncan fields in southwestern Oklahoma, in the Buena Vista and Elk Hills in Kern County, Cal.; in Buffalo Basin, Park County, Wyo.; and in Zapata and San Patricio Counties in southern Texas.

Natural gas is an ideal fuel that has been grossly wasted, but it can be replaced, though at an increased cost, by manufactured substitutes. Substitutes for natural gas, which can be prepared from raw materials abundant in the United States, include coal gas, water gas, producer gas, and for illuminating purposes, acetylene gas, gasoline, and petroleum derivatives.

Natural gas can be used in place of any other fuel, experiments having demonstrated that natural gas compressed in cylinders can even be applied as a motive power for automobile propulsion.

Epoch-making features in the natural gas industry are the development of the internal-combustion engine for the economic consumption of natural gas, whereby a saving of 90 per cent of fuel may be effected as compared with burning natural gas under a steam boiler with only 10 per cent efficiency. Other features are the development of the mud-laden process for stopping the flow of gas and conserving the supply underground until needed, and the development of the process for extracting gasoline from casing-head gas.

Some of the losses due to waste of gas may be grouped as follows:

(1) The unexpected encountering of large volumes of gas under great pressure and attendant loss of control, as at White Point, San Patricio County, Tex.; and in lack of skill or indifference of the operator in permitting wells, which could be capped at a little additional cost, to run wild.

(2) Underground leakage from a gas sand to another permeable stratum through improperly cased wells.

(3) Where the quantity of gas in individual oil wells is not great, though great in the aggregate, the gas is often conveyed to a safe distance from the well and burned. Increased recognition of the

gasoline extractable from such natural gas has caused operators to greatly reduce this form of waste.

(4) Waste in consumption includes the use of natural gas under power-plant boilers where the same power could be generated in an internal combustion engine by using about one-tenth the volume of gas; in burning, in open air, residual gas after gasoline extraction, and in burning natural gas for the manufacture of carbon black, the latter form of consumption being an unnecessary use rather than a waste, as the carbon-black industry has grown up only in localities where a large gas production is not tributary to markets where the gas might be better utilized. The remedy for most wastes lies in conserving the natural gas underground until it can be utilized to best advantage.

In the past there has been enormous waste and the total waste is still discreditable to the Nation. In the Appalachian field the loss of gas from oil wells, flambeaux, from leaking pipe lines, and many other methods of waste was not less than 1,000,000,000 cubic feet daily and probably much more. The heating value of 1,000,000,000 cubic feet of natural gas is roughly equivalent to that of 1,000,000 bushels of coal.

In one State not less than 250,000,000 cubic feet of gas has been wasted daily, and possibly more than double that quantity, 80 per cent of which might have been easily and cheaply preventable. In the Caddo (La.) natural-gas field at least 400,000,000 cubic feet of gas was wasted daily, practically all the waste being preventable. Two wells in this field having an estimated volume of 20,000,000 or 30,000,000 cubic feet per day blew out and burned for one or two years.

All flowing oil wells are also gas wells of more or less volume, not uncommonly an oil well producing 50 to 100 barrels of oil produces 5,000,000 to 10,000,000 cubic feet of gas, the latter having a fuel value at a very low figure per 1,000 feet of many times the value of the oil. The oil producer, if in need of power, has used what gas he required for power purposes and turned the balance loose, looking on any surplus gas as a nuisance to be gotten rid of, claiming the right to do as he pleased with his own product.

Through the investigations of the United States Geological Survey and the efforts of the Bureau of Mines to interest drillers and well owners in methods of lessening waste, conditions in some fields are improving, and State officials are having better success in bringing about the enactment and enforcement of practicable and adequate legislation to conserve natural gas. But there is need of much more investigation to ascertain the conditions that cause waste in different fields and to devise methods by which waste may be minimized or prevented.

STRUCTURAL MATERIALS.

CLAY AND CLAY PRODUCTS.

Clay that is suitable and available for the manufacture of clay products is one of the most widely distributed minerals, and there are clay-working plants in every State and Territory. In 1913 the clay produced in the United States was 2,648,000 tons, valued at $4,180,000. These figures refer only to clay not manufactured by the miner but sold as clay, which is only a small part of the total production. In the same year the imports, chiefly higher grade clay, were 338,000 tons, valued at $2,000,000. The United States is practically independent of the rest of the world as regards the coarser clay wares, and its production of these is greater than its consumption.

The output of clay products in the United States in 1913 was valued at $181,000,000, compared with $42,000,000 in 1880, an increase of over 300 per cent. Large as this increase is, it is not so great as was the improvement in the character and quality of the wares produced.

The higher grades of clay are used for making the better classes of pottery, tile, and refractory products, and for filling paper, and the developed deposits of white-burning clays in the United States are along the Atlantic seaboard from New England to Florida. Besides these deposits there are clay beds in Alabama, Arkansas, Missouri, Texas, Utah, and other Western States that can be drawn on for large supplies of white-burning clay when commercial conditions warrant. There seems to be no reason why, with proper preparation and technical control, they can not entirely supplant the imported clays.

Ball clay, also used in the manufacture of high-grade pottery, occurs in Florida, Kentucky, Missouri, New Jersey, and Tennessee in sufficient quantity and of suitable quality to make this country entirely independent of foreign supplies.

The greatest demand since the beginning of the European war has been for a high-grade fire clay to replace that imported from Germany for use in the manufacture of glasshouse supplies. Such clay is found in the United States and is now being used. Fire clays occur in 28 States, the principal production coming from Pennsylvania, New Jersey, Ohio, Missouri, and Illinois. One obstacle to the use of clays otherwise suited to the manufacture of high-grade wares is the presence of iron. A process for eliminating the excess of iron has been devised and successfully used and may make some undeveloped clays available for higher uses.

Exports of clay are of minor importance, being valued in 1913 at $300,000, about one-fifth of which represents fire clay. Over half

of the fire clay exported went to Canada. Of the unclassified clay exported in 1913 Germany was the largest consumer, followed by Canada, Belgium, and England in the order named.

Investigations are being conducted regarding domestic clays to replace clays formerly imported from Europe. There should be a more comprehensive study of the clays of the United States, with especial reference to the uses for which they are adapted, in order that the public may have more exact information regarding supplies of clay for definite purposes. Interest centers especially around the kaolin or china clay industry. Investigations by the Bureau of Mines have shown the wastes at some kaolin mines and the ways by which they can be lessened or prevented.

It is gratifying to know that practically every variety of clay products is produced in the United States and that the absolute independence of the country as regards the great structural, engineering, and refractory wares industries is assured, the output of these wares being greater than the consumption. The United States is almost independent as regards pottery, over four-fifths of its consumption being homemade. So one can safely say that judging by the ever-increasing proportion of domestic wares used, and the constant improvement in these wares, that the United States will before long be as independent of foreign potters as it is already in many other industries that were only a few years ago entirely dependent on the European market.

The great achievements in the clay-working industries in the last half century were made possible by the use of American-made machinery, which has a world-wide reputation for superiority. The first successful brick-making machine was invented by an American about the middle of the last century. It was small and inefficient compared with the mammoth machines of to-day which have a capacity of 100,000 brick per day of 10 hours. Improved American machinery has also been an important factor in the development of the pottery industry, among the latest achievements being a machine for making oval-shaped pieces of all kinds. Wasteful American methods of manufacture have been prevalent, but these are being overcome in modern plants by improved kilns and more scientific methods in burning.

The establishment in this country of ceramic schools, the advertising campaigns carried on by manufacturers of clay products, and the improvement in the quality of wares, has had and will continue to have a marked influence on the development of the clay-working industries. The outlook for these industries is bright, and it seems almost certain that the opportunity presented by existing conditions will result in the higher grades of American wares making a name for themselves, capturing the home market and gaining such a foot-

hold in foreign markets that when normal conditions are restored they can not be displaced.

CEMENT.

The growth of the Portland cement industry in the United States has been one of the wonders of modern industry. In 1880 there were produced in the United States 85,000 barrels of Portland cement; in 1913 the production was more than 92,000,000 barrels, valued at an equal number of dollars—the world's record of production. The comparison made graphically in fig. 6 is of interest.

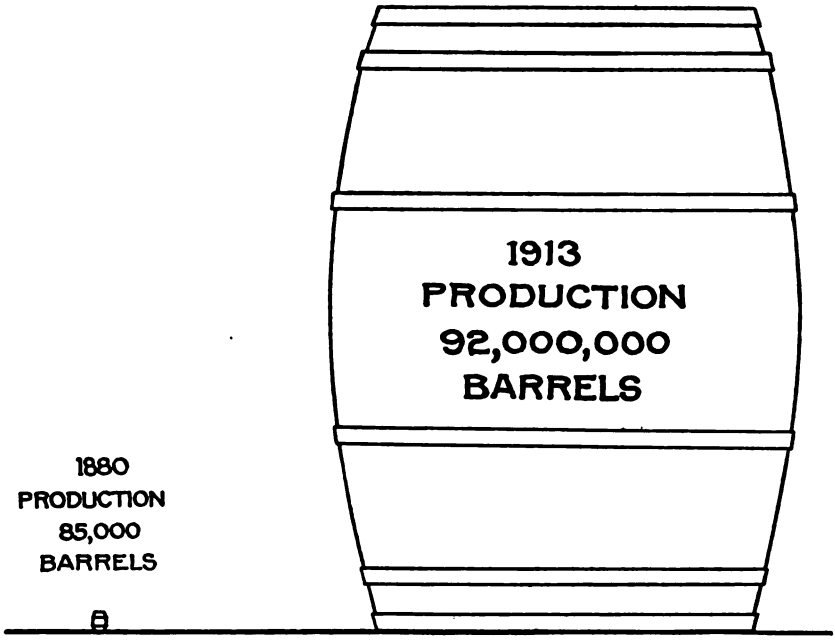


FIG. 6.—Growth in annual production of Portland cement in the United States, 1880 to 1913.

The accompanying curve, fig. 7, illustrates the phenomenal increase in the output of Portland cement since 1890. This increase, it is interesting to note, did not suffer a check from its beginning.

The United States imports relatively little hydraulic cement, only 85,000 barrels having been imported in 1913. There is little or no need to import any cement, for all parts of the country are now fairly well supplied with mills for the manufacture of Portland cement, and the supply of raw materials is practically inexhaustible. A significant feature of the cement industry, however, is the fact that, though only about 80 per cent of the normal cement-producing capacity of the country is employed at the maximum, there is often an overproduction; yet the exports of hydraulic cement have scarcely

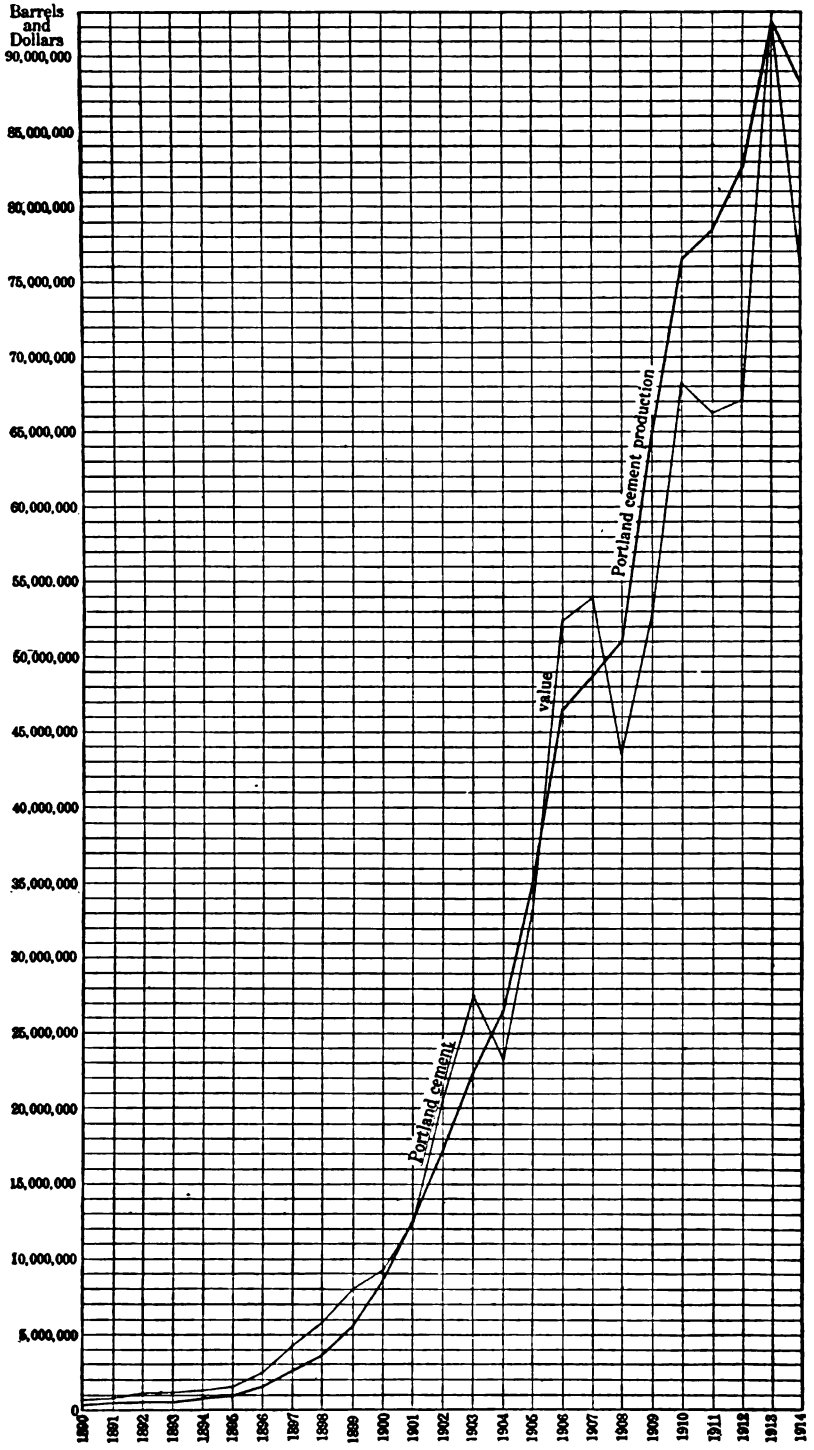


FIG. 7.—Production of Portland cement and value of Portland cement in the United States, 1890–1914.

exceeded 4,200,000 barrels in any year, this amount being only about 5 per cent of the total output—not sufficient to take care of the surplus production in a year of great activity.

There seem to be excellent reasons for stimulating the export trade to South America as rapidly as possible. Although the export of a relatively bulky and low-priced material such as cement may not promise large direct profits to an individual producer, yet the creation and maintenance of an export trade should benefit the industry at large through the opportunity to dispose of surplus stocks. American manufacturers have not made the most of their opportunities to build up an export trade. Exports of cement from England, Germany, Belgium, and France not only have been considerably greater than those from the United States, but have borne a much higher ratio to the production in these countries. Cement exports from France in recent years are estimated to have reached at least 23 per cent of the production, and from Germany about 17 per cent. There are few cement plants in South American countries, and in the past these countries have been supplied mainly from Europe. There is evidently an opportunity now for the cement industry of the United States to secure this trade. The extent to which we have made ourselves independent of foreign cement in times of peace is shown by the fact that 20 years ago the imports of foreign cement were more than 33 per cent of our domestic product, whereas in 1913 our imports were less than 0.1 per cent of the domestic production.

One reason for the absolute independence of the American cement industry is that everything needed by a fully equipped cement mill may be obtained in the United States. Some pulverizing machinery has been purchased abroad, pebbles for use in grinding mills have been imported, and possibly some of the fire clay used in the manufacture of kiln linings may have been imported; but such imports are no longer necessary. Substitutes for flint pebbles, brought from Denmark and France, are least easily procured, but there are possible domestic sources of supply in Arkansas, Mississippi, Colorado, Montana, and other States. The Colorado and Montana pebbles have been used in Portland cement plants.

The rapid development of the American cement industry dates from the introduction of the rotary kiln, fired with powdered coal, about 1895. Natural gas and crude petroleum are important kiln fuels in localities where they are cheap. Notable reductions in costs have accompanied improvements in manufacturing, so that to-day Portland cement is sold for less than one-third of its price in 1880. The reduction in price is graphically shown in the curve, fig. 8.

The facility with which Portland cement concrete is handled and its adaptability to a wide variety of uses has made possible great developments in public works. The invention of processes that render

concrete practically waterproof is a long step toward a still wider use. The use of cement concrete on the farm seems to have almost unlimited possibilities. Mining work is requiring increased quantities of cement

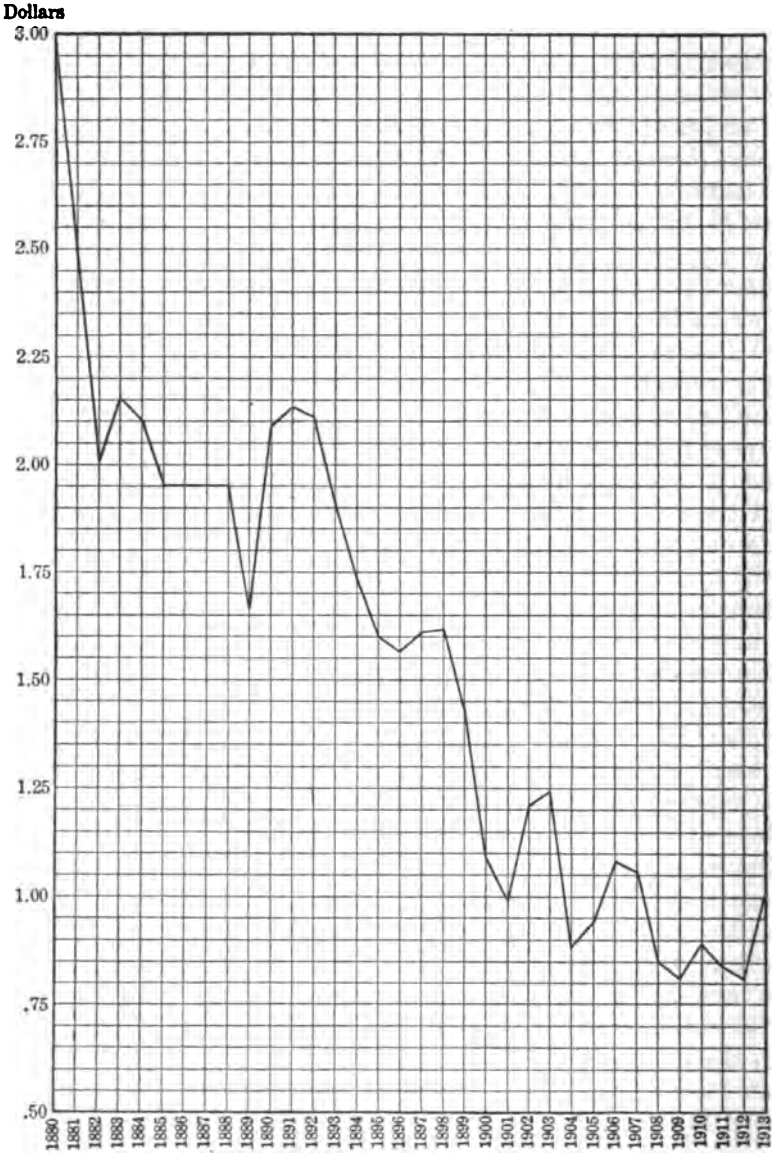


FIG. 8.—Range in average price per barrel of Portland cement, 1880–1913.

and concrete for surface structures, shaft linings, and roof supports, where it replaces wood. In the rapid development of concrete construction utility has naturally received greatest attention. The

artistic possibilities of concrete are now beginning to receive a fair share of attention.

Although Portland cement was invented early in the nineteenth century by Joseph Apsdin, of Leeds, England, the greatest development in methods of manufacture and quality of product has really taken place in the United States since 1890. To-day the superiority of practically all the American Portland cements is recognized throughout the world. In part this recognition is an outcome of the United States Government specifications that practically all cements must pass, as they are used on Government works.

One of the present needs of the cement industry is for a comprehensive survey of available supplies of sand and gravel for use with Portland cement for concrete construction—especially for concrete roads. These are materials the distribution of which counts for most in determining their economic value.

ASPHALT AND ALLIED BITUMENS.

The marketed production of natural asphaltic material in the United States in 1913 aggregated 93,000 short tons, valued at $751,000. In 1882 the entire output of asphaltic material in the United States came from a single locality in California and amounted to about 3,000 tons, valued at $10,500.

Imports of natural asphalt for consumption in the United States are at present almost wholly from Trinidad and Venezuela, the quantity brought in during the fiscal year ending June 30, 1914, aggregating 181,000 long tons, valued at $918,000.

Exports of asphalt (largely oil asphalt) from the United States in the same period amounted to 50,000 long tons, valued at $1,131,000, and in addition asphalt products manufactured in the United States, amounting in value to $362,000, were exported. Exports of crude asphalt were chiefly to Canada, Germany, West Indies, Great Britain, Argentina, and Brazil.

Oil asphalt is manufactured from petroleums produced in the Gulf coast fields and in California, as well as from petroleum of the same general type imported from Mexico. In 1913 some 437,000 short tons of oil asphalt, valued at $4,500,000, were manufactured in the United States from petroleum of domestic origin, and in addition some 114,000 tons, valued at $1,700,000, were manufactured from petroleum of Mexican origin. The utilization of the Mexican petroleum for this purpose is purely a matter of convenience in refining the petroleum, since ample supplies of suitable petroleum are available in the Gulf coast, Illinois, Wyoming, and California fields.

Natural asphaltic rock occurs in the United States in western Kentucky, southern Oklahoma, western Texas, California, and Utah, and has recently been discovered in large quantities in the Philip-

pine Islands. Solid bitumens occur in West Virginia and Oklahoma, but the most important deposits are in Utah and western Colorado.

Natural asphalt, as suitable for paving purposes as that from Trinidad and Venezuela, is not found in the United States; but by adding asphaltic residues from petroleum the natural hard asphalts and solid bitumens available in this country can be made into efficient substitutes, which guarantee the independence of the domestic paving industry should the foreign supply of asphalt be cut off.

Manjak is imported from Barbados for use in the varnish industry. No deposits of manjak of commercial importance are known in the United States, but efficient substitutes are available in the high grade gilsonite and elaterite deposits of Utah.

Ozokerite, a native paraffin wax that has been imported for many years from Galicia, occurs in Utah, but because of the cost of extracting the mineral and of transporting it to eastern markets the deposits have remained undeveloped. For all practical purposes paraffin wax prepared as a by-product of petroleum refining is an acceptable substitute for refined ozokerite.

ASBESTOS.

The United States is not a large producer of asbestos, but there are asbestos deposits in Georgia, Arizona, California, Virginia, and Vermont. The domestic production amounted to 7,600 tons in 1911, while the imports, largely from Canada, amounted to ten times this quantity. The Canadian asbestos mines at Thetford, Quebec, are the largest in the world, and the United States absorbs nearly three-fourths of their output. This country exports considerable quantities of articles manufactured from asbestos.

Asbestos is the most important fireproofing material known. Its fibrous structure adapts it to a wide range of applications from woven fabrics, such as theater curtains and articles of clothing, to various forms of asbestos board and paper, pipe covering, shingles, plaster, etc. For a few purposes asbestos finds a competitor in magnesite, which is also a refractory material, but for most of the purposes to which it is applied it is practically without a rival.

CHEMICAL MATERIALS.

PHOSPHATE ROCK.

Thirty-five years ago the production of phosphate rock in the United States was 211,000 long tons. During 1913, production amounted to 3,111,000 long tons and exports to 1,366,000 long tons, or nearly 44 per cent of the total production marketed. Thus it will be seen that in 34 years the production of phosphate rock in the

United States has increased nearly fifteenfold. The accompanying curve, fig. 9, shows graphically the marketed production and the exports of phosphate rock during the past 10 years.

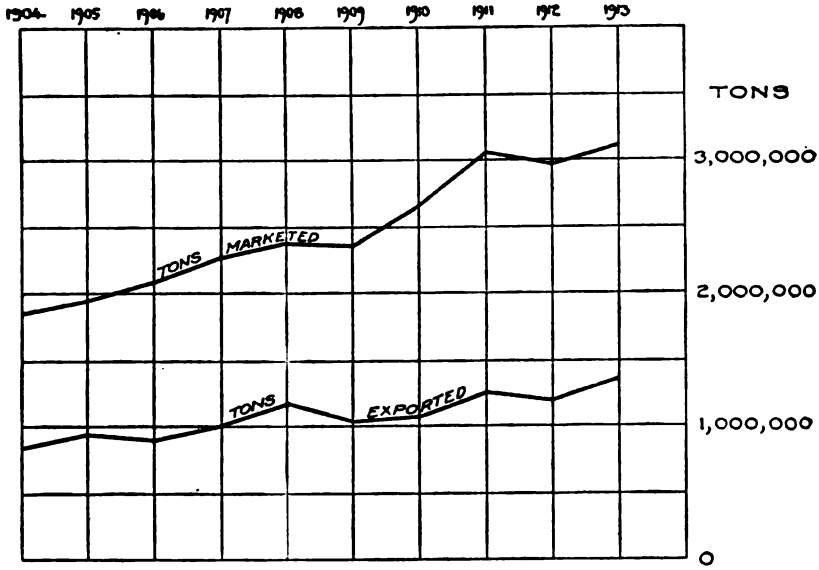


FIG. 9.—Curve showing production and exportation of phosphate rock, 1904–1913. (Note that exports tend to diminish compared with production.)

As the figure shows, a very large part of the phosphate rock is shipped abroad, but the amount exported, compared with the total quantity marketed, shows a tendency to diminish. The quantity of phosphate rock or phosphate-bearing compounds imported into the United States for use as fertilizer is exceedingly small.

The known phosphate producing areas in the United States are as follows: (1) In middle Tennessee; (2) along the western side of the Florida peninsula, extending 25 miles inland; (3) on the South Carolina coast, chiefly near Charleston; (4) a large area in Utah, Idaho, Wyoming, and Montana. In addition, there are important deposits in the Blue Grass region of Kentucky, and less well-known areas in Arkansas and elsewhere. Thus it will be seen that the important phosphate-bearing areas are not confined to any one district of the country but are widely scattered and are available to all parts of the United States. Most of the rock exported has been produced in Florida and Tennessee.

Phosphate rock is used chiefly in the manufacture of fertilizers, especially the so-called complete fertilizers. For this reason it is a commodity of vital concern to the farming industry in the United States and hence to all the people. There are no substitutes for it. Consequently the quantity of phosphate rock available for future

generations and the efficient utilization of this supply are of paramount interest and importance.

Calculations of the probable future life of our phosphate reserves have been made, but these calculations are subject to change as new factors arise for consideration. Among the more important of the new factors, that will tend to prolong the life of the deposits, especially those in the East, is the extensive introduction of improved mining and milling methods, by which deposits that were thought to have been worked out and tailings dumps and waste ponds from old phosphate mills are being reworked, and lower-grade rock is being mined at a profit.

Through the introduction of such methods deposits in Tennessee will yield rock for many years to come and the experience gained in Tennessee will be applied in the practically virgin central Kentucky field.

Nearly all the "hard rock" mined in Florida is shipped abroad. The life of the hard-rock field has been estimated at 25 to 100 years, depending on the rate of production. Very few new deposits are now being discovered and many of the old ones are now worked out. In washing the phosphate rock there have been large losses. In time some of the refuse will be retreated and losses will be greatly reduced. The mining of pebble rock in Florida has grown rapidly and in 1913 the output exceeded 2,000,000 tons. The deposits of this rock are so large that their end is not in sight.

A recent estimate of the phosphate rock in the South Carolina field indicates the presence of 5,000,000 tons of 60 per cent rock in the ground which will become workable when improved machinery is devised. Other estimates have been larger. The output of South Carolina rock in the past two years has been slightly in excess of 100,000 tons, and at this rate the field may be expected to last at least 50 years.

The known extent of the western phosphate reserves has been greatly increased in the past few years through the work of the United States Geological Survey which has resulted in including more than 2,660,000 acres of land in the phosphate reserves of the United States. Most of this land is in Idaho and Wyoming; some in Montana and Utah, and some in Florida. The work of surveying the western phosphate lands is still going on. Clearly, however, the United States is independent of the rest of the world as regard phosphate rock, and can produce enough for its own needs for an unknown number of years to come.

Phosphate rock is relatively insoluble, and the phosphoric acid it contains is converted into the easily soluble form, and thereby made readily available as plant food by treating the rock with acid. A cheap powerful acid is needed, and thus it happens that an

important factor in the development of the phosphate industry is the use of plants for recovering sulphuric acid from the fumes given off in roasting and smelting sulphide ores. This acid being recovered partly in efforts to prevent damage from smelter smoke, is produced in large quantities and is sold cheaply. At present there is no market for all the acid that could be produced, but the presence of large smelting plants within a relatively short distance of the phosphate fields of Tennessee and of the West assures an adequate supply of cheap superphosphate for agriculture.

In the eastern fields the waste in mining is large. In some places more phosphate is discarded than is saved. No doubt most of this low-grade waste material will eventually be utilized, as some of it is already being put to use. The progress made in reworking waste material in Tennessee has been indicated.

Considering the industry as a whole, the progress toward more efficient methods of mining and treating the rock has been great. Low-grade deposits are becoming of commercial value; waste dumps are being rewashed, and old mines reworked at a profit. Among the possibilities of the future are the possible introduction of chemical methods whereby low-grade deposits can be converted into concentrated forms and shipped at a profit, the direct application of low-grade phosphate rock to the land, and the utilization of other sources of phosphate, for example, the mineral apatite and phosphate-bearing slags, large quantities of the latter now being wasted.

SULPHUR, PYRITE, AND SULPHURIC ACID.

Through the inventive genius of an American, Herman Frasch, the United States occupies the dominating position in the sulphur industry of the world, and Italy (Sicily), which formerly held this position, now ranks second. By the Frasch process superheated water is forced into the sulphur deposits and pure molten sulphur is pumped to the surface. From an output of a few thousand tons in 1900, there was a marketed production in 1914 of 328,000 long tons, valued at nearly $6,000,000, and in the same period imports from Sicily to the United States dropped from 168,000 tons to less than 1,000 tons, although the total Italian exports were approximately 340,000 tons. The total imports amounted to 26,000 tons, or only 8 per cent of our own production. This foreign sulphur came chiefly from Japan to the Pacific coast.

The United States not only produces enough sulphur for home consumption, but has begun to place sulphur on the European market. In 1909 the United States exports of sulphur amounted to 37,000 long tons and in 1914 nearly 100,000 tons, an increase of 270 per cent.

The principal sulphur deposits are along the Gulf coast in Louisiana and Texas. The conditions which obtain at Sulphur, La., and Freeport, Tex., exist at many other places in the coastal plain region of these two States, and doubtless other deposits of sulphur will be revealed in the future by deep drilling.

There are going on in the United States at present certain investigations which may prove of far-reaching importance in the sulphur industry, and by them may be illustrated the old adage that "necessity is the mother of invention." Two Americans, S. W. Young and William A. Hall, during the past few years have been working on processes whereby destructive fumes from smelters—the so-called sulphur fumes—will be converted into sulphur and at the same time rendered harmless, thus accomplishing two most desirable results.

The processes of Hall and Young are in a different class from those now extensively employed in the manufacture of sulphuric acid from smelter gases. Destructive smelter gases for years have been a source of expense to smelter men and a pronounced annoyance to farmers and others living near the smelters. By the utilization of these gases in the manufacture of sulphuric acid they cease to be nuisances and become a source of wealth. One copper-smelting plant in southeast Tennessee has perhaps the largest sulphuric-acid plant in the world, and acid is now being made at copper smelters in Arizona and California, while by-product acid from the sulphur fumes of zinc smelters is made at places in Pennsylvania, Ohio, Indiana, Illinois, Kansas, and Colorado. The production of acid from smelter gases in 1911 was 548,000 tons, and in 1914 it was 951,000 tons, the remarkable growth of a profitable industry from what was a waste product.

Pyrite, the mineral used primarily in making sulphuric acid, was produced in the United States to the extent of 341,000 tons in 1913. Imports were 851,000 tons, chiefly from Spain, Portugal, and Canada. The great difference between production and imports is explained by the fact that most of the pyrite imported is used along the Atlantic seaboard, and by reason of low ocean freights can be imported more cheaply than it can be produced at home. This does not mean that we are deficient in pyrite resources, for the pyrite deposits in the United States can furnish a much larger tonnage.

Pyrite is a by-product in coal mining in several States, notably in Pennsylvania, Ohio, Indiana, and Illinois. Formerly it was discarded, but in 1914, 31,500 tons, valued at $84,000, were produced in the three States. This is a domestic source of pyrite which has hardly been touched and could be made to yield large returns should the necessity arise. At present, where no trouble is taken to save and use this pyrite, it is thrown on the culm dumps, to become not only a waste but a nuisance.

The utilization of the residues from the roasting of pyrite is another commanding problem. Pyrite contains 53.4 per cent sulphur and 46.6 per cent iron. Roasting removes nearly all the sulphur, but about 2 per cent remains in the cinders and prevents that from being a valuable iron ore for direct smelting. Now this cinder is roasted to a clinker, removing the sulphur and making the clinker a first-class iron ore. This method of utilizing a waste product is in use in southwest Virginia, and without doubt its use will become general.

Sulphuric acid is a commodity so extensively used in the manufacture of other chemicals that it has come to be regarded as a criterion or gauge of the activity of the country in chemical manufactures in general. It is probably used for a greater variety of purposes than any other chemical, one of the more important being the manufacture of superphosphate, used in artificial fertilizers, from phosphate rock. The total sulphuric acid production in the United States in 1914 was 3,762,000 tons, valued at more than $24,000,000.

Although under present commercial conditions governing the manufacture of sulphuric acid the United States imports pyrite to be used as a source of acid, this country is absolutely independent of the world as regards sulphuric acid itself. One smelter in Montana produces sulphur gases sufficient to make more sulphuric acid than is required by the fertilizer industry of the whole country. Yet under the special demands of the present year there is a shortage of sulphuric acid.

POTASH SALTS.

Practically all the potash salts used in the United States have come from Germany, the imports amounting to $15,000,000 annually. The magnitude of the value of the imports, which include fine chemicals imported by the pound and crude salts imported by the ton, is significant. For many years the United States has been dependent on Germany for this commodity, of which Germany has had a natural monopoly.

The fertilizer industry consumes large quantities of these German potash salts. Other industries in which potash salts are consumed in large amounts are the soap, matchmaking, glass making, photographic, pharmaceutical, and the chemical industries in general. The list of potash chemicals is large and very important. These chemicals are used as alums in the dyeing industry as a mordant, and also by paper and leather makers, in pigment lakes, in medicine, etc., in making cyanide which is used in assaying and in metallurgical operations, especially the recovery of gold from low-grade ores and tailings; and red and yellow prussiate of potash are used in making dyes and for other purposes; in the manufacture of explosives; bleaching materials; and in making other important chemicals.

As a result of the European war prices have greatly advanced. High-grade chloride of potash used in fertilizer now brings $220 and upward per ton, as compared with approximately $40 per ton at the outbreak of hostilities abroad.

Since the complete dependence of the United States on Germany for its potash salts was forcibly impressed upon the people of this country in a controversy that arose about five years ago, the Government has been actively engaged in searching for potassium salts in this country. This search is still going on. The following possible sources of potash salts are being investigated: (1) Saline residues; (2) natural and artificial bitterns; (3) alunite and similar minerals; (4) the igneous rocks and minerals like the potash-bearing feldspars; (5) the greensand marls found in large quantities in New Jersey, Kentucky, Tennessee, and other States; and (6) organic sources, such as seaweed, molasses residues, wool scourings, etc. Experiments on nearly all these sources have been conducted or are in progress and reports indicate that to a certain extent, at least, the United States soon may be relieved of absolute dependence on foreign sources of potash salts.

The Geological Survey and the Bureau of Soils jointly called attention in 1912 to the importance of the deposits in Searles Lake, Cal., as a source of potash salts, and though no potash salts have yet been produced at Searles Lake the potash content of this lake is well determined.

Some potash salts, however, have been shipped this year from an alkali lake in Nebraska, reported on in 1913 by the Geological Survey.

One of the promising sources of commercial supplies of potash salts in the United States is the group of alunite veins that has been prospected and developed in the vicinity of Marysvale, Utah, during the last four years. Shipment of potassium sulphate from this area began in October. With the extraction of potash from alunite alumina is secured as a by-product, the first known western source of an aluminum ore.

The possibility of obtaining potash salts from feldspar and other silicates is being eagerly investigated by American inventive genius. In this connection the United States Geological Survey publications on potash-rich igneous rocks and potash-bearing "tailings" from porphyry copper ores have proved to be of importance.

A portion of the Geological Survey's special appropriations has been spent in deep drilling in the arid parts of the West. No deposits of potash salts have been found, but the work is still going on. Conclusions based on the work done have eliminated certain basins from those likely to contain potash salts. Such conclusions, though negative, are of real value to the American citizen bent on ex-

ploring for potash salts in the great American desert. The so-called red beds of the Southwest may also be a possible source, and are being given a thorough geological study, aided by test wells.

The problem of a domestic supply of nitrates is in much the same category as the domestic supply of potash salts. We are entirely dependent on Chile for our supply of natural nitrates, the imports from that country amounting to about $20,000,000 annually. Chile occupies the unique position of being the sole supply of the naturally occurring nitrate, as does Germany in the case of potash salts.

Between 20 and 25 per cent of the nitrate imported finds its way into fertilizers. A part of it is converted into nitric acid and potassium nitrate, used in making gunpowder and other explosives. Both the potash and the nitric acid used in making potassium nitrate are imported. The nitrates are also used in making matches and fireworks, in the manufacture of sulphuric acid, in metallurgical and analytical operations, and in curing meats.

Nitrates can be made from the nitrogen of the air by electrolytic processes. This is now being done, but on a very small scale within the limits of the United States, although successfully on a large scale in Norway. Nitrogen compounds used in fertilizers are now being made at Niagara Falls, Canada, and are being imported into the United States. These take the place of nitrates in fertilizers. The manufacture of nitrates by electricity requires expensive installation and an abundance of cheap water power. To render the United States independent in the matter of nitrates and nitric acid, factories must be installed, and it is very doubtful whether, in case of need, the United States could begin the manufacture of the necessary supply of nitrates without the loss of much valuable time.

By the substitution of by-product coke ovens in place of beehive ovens there becomes immediately available large quantities of ammonium sulphate, the nitrogen constituent of which might be used in the fertilizer industry.

SALT, BROMINE, AND CALCIUM CHLORIDE.

The marketed production of salt in the United States in 1914 was 4,900,000 short tons, valued at $10,000,000, which is about seven times the production and value of this commodity in the United States in 1800. (See curve of production, fig. 10.)

The United States furnishes very nearly all the salt consumed by our people. For many years the country has been able to supply the domestic demand, since the present capacity of both mines and manufacturing plants is 20 to 25 per cent in excess of the present output. Many plants now working at partial capacity, or entirely shut down, could resume operations on short notice.

Great strides have been made in recent years in methods of making high-grade salt both by the grainer and vacuum-pan processes. The mechanical grainers, in which the brine enters the plant and in which the salt is not touched by human hands till it is almost ready for shipment, are marvels of ingenuity. Fine table salt is now made almost exclusively by the vacuum-pan process, which has so reduced the cost of making fine salt that the old-time methods have passed into history.

The salt-producing States are scattered throughout the country from New York to California and 15 States reported a production

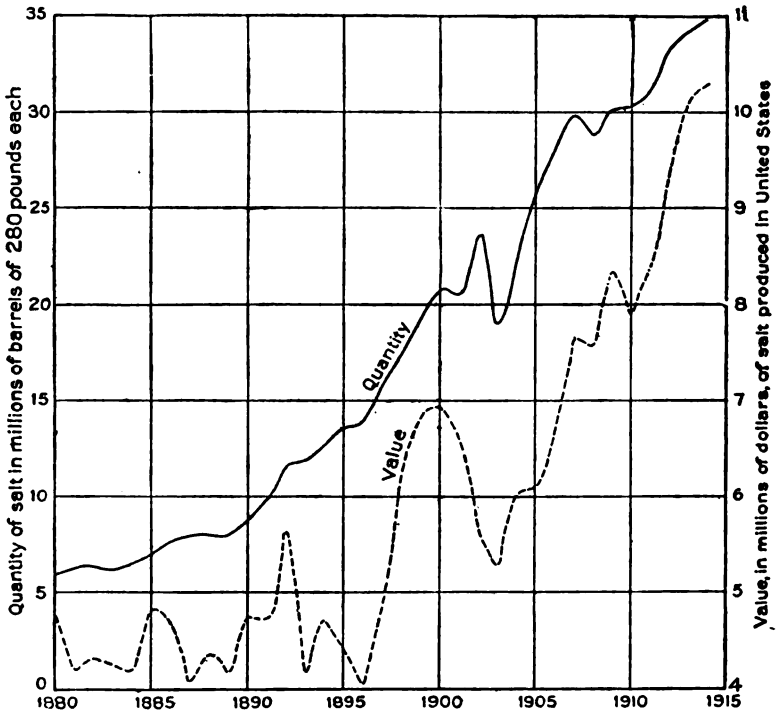


FIG. 10.—Curves showing growth in quantity and value of salt produced in the United States, 1880–1914.

in 1914. Salt of all grades is made, from the rock salt to the finest grades for table and dairy. Salt is produced from both natural and artificial brines; from the water of Great Salt Lake and the Pacific Ocean; while in New York, Michigan, Kansas, and Louisiana it is mined as rock salt. There are a number of wells in western New York and southern Michigan where fresh water is run by gravity or pumps into the salt beds and the brine run out by the excessive fresh-water head. This system has resulted in exceedingly low-mining costs. It may be truly said of this commodity that the supplies are

inexhaustible and that the United States can not only supply her own needs but those of the world.

Bromine is obtained in connection with the production of salt in Ohio and West Virginia and to a certain extent in the Saginaw Valley, Mich. In Michigan the bromine is marketed in the form of fine chemicals. That produced in West Virginia and Ohio is largely shipped abroad and returned to the United States as fine chemicals and we pay the costs. Along the Ohio River, where there is cheap rail and water transportation, where there is an abundance of cheap coal and gas, and where salt and bromine occur naturally, it is to be regretted that a valuable material like bromine has to leave the country to be made into fine chemicals. Here is an opportunity for the American chemist.

Calcium chloride is also made from the natural brines in the Ohio Valley and thus practically every constituent in the brines can be saved and turned into profit. The large quantities of this chloride formerly wasted in connection with the manufacture of soda are now being used in part and it is hoped that new uses for that which is now wasted will soon be found by the American chemist.

FLUORSPAR.

The fluorspar industry of the United States has shown a steady growth from a production of 4,000 short tons in 1883 to 116,000 tons, valued at $736,000, in 1913. This notable gain, shown graphically in fig. 11, has resulted largely from the growth of the open-hearth process of steel manufacture, which absorbs about 80 per cent of the fluorspar produced. Fluorspar is used also as a flux in blast furnaces, iron foundries, and silver, copper, and lead smelters; in the manufacture of fluorides of iron and manganese for steel fluxing; in the manufacture of glass and enameled and sanitary ware and of hydrofluoric acid; in the production of aluminum; in the electrolytic refining of antimony and lead; and for many other purposes.

The increase in the home production and the imposition of a tariff on fluorspar in 1909 have resulted in a marked decrease in the amount brought in from foreign countries, and in 1913 only about 23,000 short tons were imported, compared with the 116,000 tons produced at home. The imports come almost entirely from dumps of abandoned lead mines in England, and amount to over 55 per cent of the total English production. The English product entering at New York is able to compete with domestic "spar" as far west as Pittsburgh.

There is an adequate American supply to meet all demands in case of extreme necessity. In 1913 the output came from Illinois, Kentucky, New Mexico, Colorado, New Hampshire, and Arizona, named

in the order of yield. Furthermore, the foreign spar is of lower grade than the mechanically treated spar from Illinois and Kentucky,

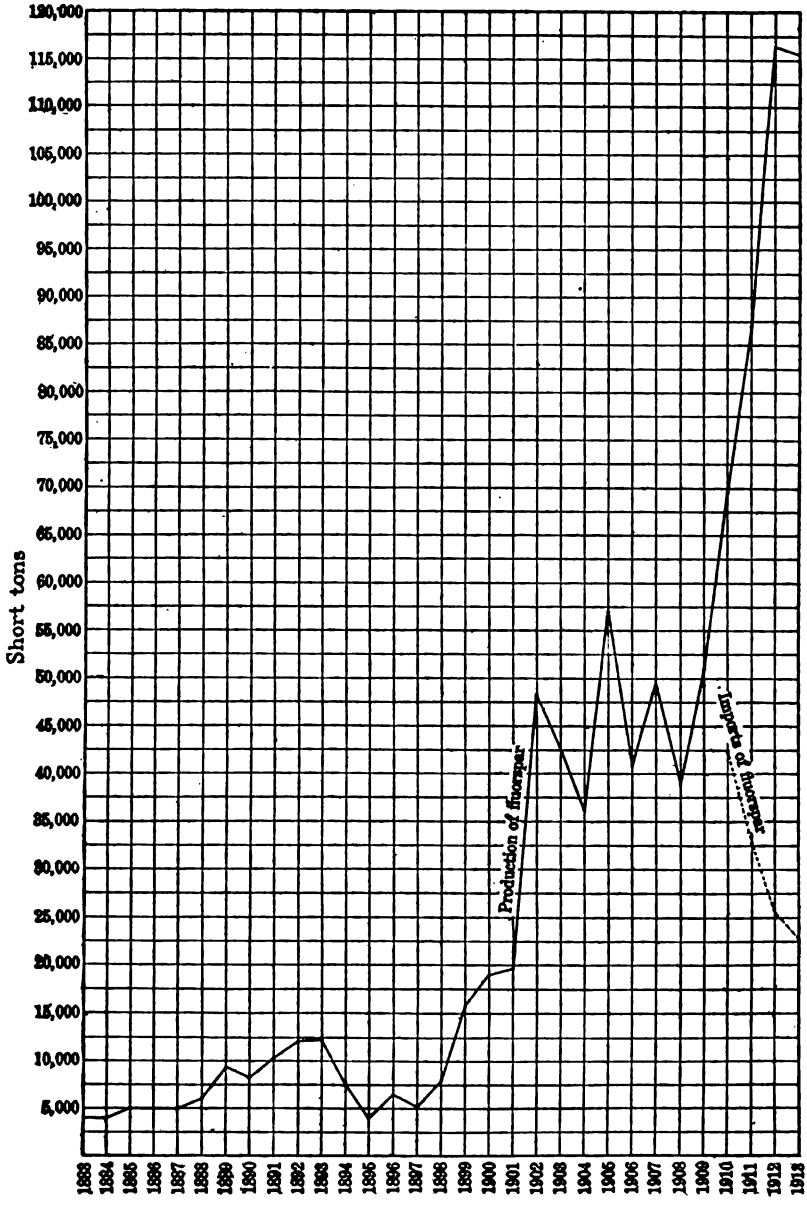


FIG. 11.—Production of fluorspar in the United States, 1883–1913, and imports, 1910–1913.

and as fluorspar is of value chiefly according to its purity, purchasers find that the purer American spar is more efficient, and consequently

cheaper in the end. Problems concerning the milling and separation of fluorspar from its gangue minerals might be undertaken by the Government with benefit to the industry.

BARYTES.

In 1880 the output of barytes in the United States was about 12,000 short tons, while in 1914 the United States produced approximately 51,500 short tons, valued at $154,000. During that year 4,300 tons of crude barytes, 24,400 tons of ground barytes, and $478,600 worth of barium chemicals were imported, mainly from Germany. So far as known no barytes is exported from the United States.

Barytes is found in many States, but its commercial production at present is largely from Missouri, Georgia, North Carolina, Tennessee, South Carolina, Virginia, and Kentucky. Workable deposits exist in California, Nevada, Idaho, and in about all of the Atlantic seaboard States. A large deposit of high-grade barytes was recently discovered by the United States Geological Survey on the coast of southeast Alaska. The United States, therefore, has an ample supply of the crude mineral.

The principal use of barytes is in the manufacture of lithopone, a white paint consisting essentially of barium sulphate and zinc sulphide. Considerable quantities of ground barytes are used in the manufacture of rubber, mixed paints, artificial ivory, as a filler for heavy glazed paper, and in the manufacture of fireworks and night signals. Heretofore only small quantities of barium chemicals have been manufactured in this country, but with the stoppage of foreign supplies during the last few months the barytes chemical industry has begun to awaken, and there are now several companies making barium salts, such as chloride, peroxide, nitrate, etc.

European ores have been particularly used on the Atlantic seaboard, where they could formerly be obtained cheaper than domestic barytes. Our independence of Europe is not a question of our supply of barytes, but rather of better recovery in mining and treatment so as to cut the cost of production. With proper crushing, washing, and concentrating the Georgia barytes, containing 90 per cent barium sulphate, could be made into a 96 per cent product, and at small cost. The methods of mining are wasteful, and in most mines pieces of barytes under an inch in diameter are not recovered, although with very little additional equipment all could be saved.

STRONTIUM.

No strontium-bearing minerals were produced in the United States in 1880 and none in 1914, though there has been a very small domestic

output in various intervening years. The recorded imports of strontium salts in 1914 amounted to $1,000, but it is known that in the neighborhood of 2,000 tons of salts were manufactured in this country from foreign ores largely of English origin. Sicily, England, and Germany also produced strontium ores.

Relatively small, irregular deposits of celestite, an ore of strontium, are known in New York, Ohio, Texas, West Virginia, Michigan, Pennsylvania, Kansas, Colorado, Tennessee, and California. Some celestite has been and could still be produced from the first four States. What seems to be larger and more persistent strontium-bearing deposits have been recently discovered in southern California and central Arizona.

The principal use of strontium salts in the United States is in the manufacture of fireworks and railway night signals. A very small quantity is used in medicine and in chemical work. Probably the largest use of strontium in Europe is in the refining of beet sugar, but as yet the strontium hydroxide method has not been adopted by American manufacturers, who use calcium hydroxide, which is much cheaper.

BORAX.

Of borax and boric acid, the former a necessity to every blacksmith, and both a convenience to every housekeeper, the United States has enough in the colemanite deposits of California to supply the domestic needs for many years, and other large supplies in "marshes" and *playas* located in California, Nevada, and Oregon. Although boron salts and minerals are imported into the United States, the matter is one of convenience and not of necessity.

MISCELLANEOUS MINERALS.

FELDSPAR AND KAOLIN.

The feldspar industry in the United States is conducted by small operators, few of the mines being sufficiently large to warrant the employment of technical men to carry on operations. The extensive reduction of existing waste, the preparation of a standard product, and the marketing of guaranteed material become possible when the losses are understood and the just requirements of the purchaser are realized. Investigations have been conducted by the department to discover the wastes and the possible by-products incident to production and point out methods for their recovery, to encourage efficiency in mining and treatment with the hope of enlarging the output and of increasing the quality and utilization of the product, and to determine by actual tests the physical constants and the general classification of the material from the various workable deposits. Among

the conclusions reached from the above investigations it is found that the raw material from the Appalachian region has no superior for color, but that there is great need of some central agency or depot by which the output of many small mines may be mixed and graded under the supervision of a trained ceramic chemist. Such control would insure the manufacturer receiving a product of known physical constants and would also insure a constant and ready market for the product. There can be no doubt of the United States being fully able to supply practically all of the feldspar and kaolin required for domestic consumption, and that in quality the materials now available in the Appalachian region are excelled by none.

In 1914 the production of feldspar in the United States was 135,000 tons, valued at $630,000, as compared with a production of 14,000 tons in 1883. Only small quantities of high-grade feldspar are imported from Canada and with the prepared grade of the domestic product there is but small reason that any should be imported. The exports to date have been none.

The feldspar quarries of the United States are confined to the eastern seaboard States, along the Appalachian Mountain Range, with the exception of a few quarries that have been developed in California.

The most important use of feldspar is for glazing of various grades of pottery and vitrified sanitary and electrical wares. It is also a constituent of the glaze of enamel ware, enamel brick, and tile. Attempts are being made to extract the potash content from feldspar, and when a process of this character is completed on a commercial scale it will then add another source to the domestic supply of potash.

The kaolin industry goes hand in hand with that of the feldspar industry inasmuch as kaolin is a decomposition product of the natural feldspar, both occurring in the same localities.

MICA.

Mica is indispensable in the manufacture of electrical apparatus and machinery, is widely used in glazing articles exposed to heat, and is also used for decorative purposes, as in the manufacture of wall papers. Other uses are in the preparation of lubricants, fancy paints, rubber goods, tar roofing papers, and boiler and pipe coverings. The manufacturing industries of the United States use more mica than those of any other one country. The supply is obtained from domestic mines and from imports, chiefly from India and Canada.

The production of sheet mica in the United States in 1880 amounted to 81,700 pounds, valued at $128,000. In 1913 this had increased to 1,700,000 pounds, valued at $353,500, with a production of 5,300 short tons of scrap mica, valued at $82,500, or a total value of

$436,000. These increases are shown graphically in fig. 12. In 1913, 2,239,000 pounds of sheet mica, valued at $943,000, were imported into the United States, chiefly from India and Canada. In 1913, $62,000 worth of unmanufactured and manufactured mica products were exported from the United States, chiefly to Belgium, Germany, England, France, Canada, Mexico, and Japan.

The domestic supply of mica has been obtained from about a dozen States, the more important being North Carolina, New Hampshire, South Dakota, Idaho, New Mexico, Colorado, Virginia, South Carolina, Alabama, and Georgia. It is probable that some of the promising deposits found in Maine, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Wyoming, California, Nevada, Washington, Arizona, and Utah could be worked under present conditions, and many of them will undoubtedly prove of future value.

The two chief factors in the development of the industry to its present size since 1880 are the use of large quantities of mica in small

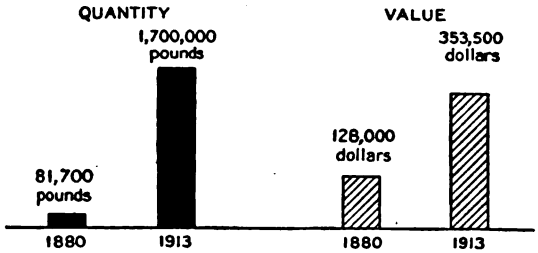


FIG. 12.—Production of sheet mica in 1880 and 1913 compared.

sheets for the electrical industry and the continually increasing demand for ground mica obtained from the scrap or waste in preparing sheet mica. The demand for scrap mica has made profitable the working of many mica mines that could not be profitably worked for large-sheet mica alone. The returns from some mines have been increased by sales of feldspar or gem minerals associated with the mica and saved as by-products. At the larger mines costs have been reduced by the use of better equipment. There is now practically no waste in manufacturing mica, since all of the scraps from trimming sheet mica are saved and used to make the higher grades of ground mica.

The United States can hardly be said to be independent of the rest of the world with industrial conditions as they are at present, but unquestionably the United States could obtain from within its borders mica enough for its needs, though of course at higher prices. Also it is possible that substitutes would be employed for the large sizes of sheet mica, if the cost of producing these sizes became excessive.

FULLER'S EARTH.

The United States produces more than two-thirds of the fuller's earth it consumes; and, when it is considered that deposits of this mineral were unknown in this country prior to 1891 and that prior to 1895 there was no regular production, the progress of the industry has been remarkable. The production of fuller's earth in 1913 was about 39,000 tons, valued at $397,000; the imports were 18,600 tons, valued at $146,000.

The principal sources of supply are in Florida, Georgia, and Massachusetts; but there was a small production during 1913 in Arkansas, California, Colorado, and South Carolina. Other deposits from which large supplies may be drawn occur in Alabama, Arizona, Arkansas, Mississippi, Nebraska, New York, South Dakota, Utah, and Virginia, so that the supply is adequate and our industrial independence with reference to this commodity is assured.

Fuller's earth is used in the manufacture of wall-paper pigments; for detecting certain coloring matters in food products; as a substitute for talcum powder; and for fulling cloth. But its principal use is for bleaching or filtering mineral and vegetable oils and animal fats.

Many samples of American earth are distinctly superior in bleaching power to the English earth, and investigations conducted by the Bureau of Mines have shown the fuller's earth of the United States to be better suited for refining edible oils than the imported product. In order to assure the almost universal use of this earth by American refiners of oil there is required only a careful and intelligent technical control of the preparation of the output and its application to the bleaching of oils.

In the use of fuller's earth for bleaching oils there is apparently a necessary waste of approximately 25,000 tons each year. This discarded material also carries with it between 2,500 and 5,000 tons of valuable edible oil as well. The methods of revivifying fuller's earth used in refining mineral oil are not applicable to earth used in refining edible oils, and according to actual practice on such oils fuller's earth is now used but once. To revivify fuller's earth residues from edible oils is an easy matter in the laboratory and apparently requires only the solution of mechanical detail to make it practicable in the factory. This process completed will utilize a second and third time at least 20,000 tons of fuller's earth each year, and in addition save thousands of tons of valuable oil. The process has been tried many times with laboratory samples, and the bleaching power was not diminished in the slightest. It remains for American inventive genius to discover a method by which this process may be carried out successfully on a commercial scale.

GRAPHITE.

In 1880 the output of natural graphite in the United States was valued at approximately $50,000, whereas in 1913 it was valued at $324,000, an increase of 650 per cent. The natural graphite produced in 1913 was 4,340 tons, as compared with 5,230 tons of artificial graphite. The value of artificial graphite is approximately double that of natural graphite, and has largely taken the place of the better grades of natural graphite formerly imported from Ceylon, Korea, Mexico, and Canada, although imports from those countries amount to more than 20,000 tons annually. Practically none of the crude

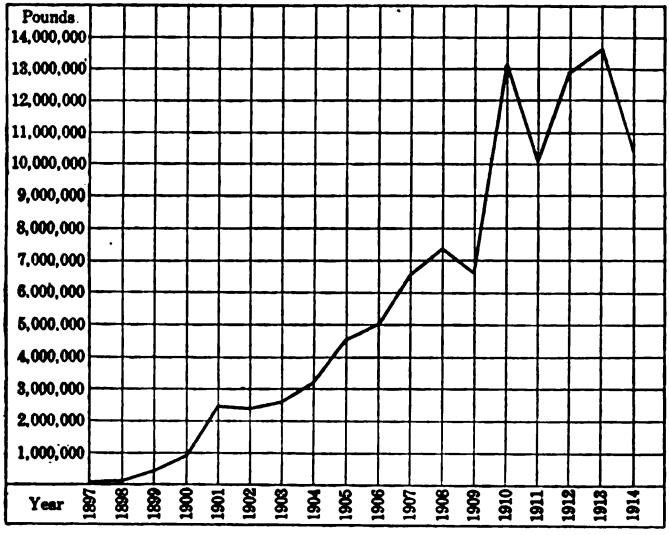


FIG. 13.—Diagram showing production of manufactured graphite in the United States from inception of the industry in 1897 to 1914, inclusive.

graphite produced in the United States is exported, but the United States does export graphite products of domestic manufacture.

The principal areas in which natural graphite is produced are from the Adirondack Mountains in New York to northern Alabama. In addition a number of mines in the Western States produce small quantities.

Graphite is manufactured on a commercial scale from amorphus carbon (anthracite coal or petroleum coke) at Niagara Falls, N. Y., by the Acheson process, a distinctly American achievement. This process, which employs the electric furnace, was patented in 1896, and its commercial development has been so rapid (see the curve, fig. 13) that the output of artificial graphite exceeds this country's production of natural crystalline graphite by more than 900 tons.

Anthracite coal containing little ash is used for manufacturing ordinary grades and petroleum coke for the purest grades. An important part of the industry at Niagara Falls is the graphitization of rods and bars of amorphus nongraphitic carbon for use mainly in electrodes in electro-chemical industries. In spite of the output of artificial graphite, the demand for the natural product has increased very largely in recent years, because of the growth of the industries in which it is used.

Graphite finds its principal practical application in the manufacture of crucibles and other refractory products for use in the steel, brass, bronze, and other metal industries. Its chemical inertness and ability to withstand high temperatures make it invaluable for such purposes. Graphite crucibles are superior to clay crucibles for such purposes, because they conduct the heat more readily from the fire without to the metal within and because they are stronger. It is essential in the manufacture of lead pencils and the better grades of stove polishes, and is also used for foundry facings, paints, and for lubrication. Artificial graphite is suited for nearly all the uses to which natural graphite is applied except the manufacture of refractory wares.

Most of the American deposits do not yield as pure graphite as a number of foreign deposits, in particular those of Ceylon, but the mechanical difficulties of concentrating the low-grade native product have been partly overcome and several concerns in the eastern United States now produce grades of natural graphite that successfully compete with high-grade foreign products. Although at present the imports of natural graphite are more than four times as large (by value) as the domestic production, there can be no question whatever that in event of the foreign supply being cut off the domestic production, including the artificial, could be rapidly expanded to fully meet all our requirements for decades.

MINERAL WATERS.

The total production of mineral waters, including both medicinal and table water, in the United States in 1913 from 838 commercial springs was 58,000,000 gallons, valued at $5,600,000, an average value of 10 cents a gallon. The production in 1883, the first year for which reliable statistics are available, was 7,500,000 gallons, valued at $1,100,000, or at an average value of 15 cents a gallon, and the total number of commercial springs was 189. The number of commercial springs has increased almost regularly since 1883. In 1913 the value of medicinal waters was $1,428,000 and that of table waters $4,200,000.

The total imports of mineral waters into the United States in 1913 amounted to 3,365,000 gallons, valued at $956,000, or an average price of 28 cents a gallon. More than two-thirds of the imported water comes from France, Germany, and Austria-Hungary. The imports comprise all classes of water, but with the exception of one well-known table water are mostly medicinal waters. There are no statistics regarding exports of mineral waters from the United States, but it is understood that only a few, like Poland, Pluto, and Abilena, are exported. Fourteen States produce more than 1,000,000 gallons a year each, the leaders in order being New York, Wisconsin, California, Maine, Indiana, and Virginia.

The chemical composition of mineral waters is so complex and various that it is practically impossible to match one natural water with another. However, practically all foreign waters can be duplicated as to main constituents and general character by dozens of waters in this country. Sulphate, sulphur, carbon-dioxated, and all other varieties are found in various parts of the United States, and doubtless nothing except their names keeps up the sale of foreign waters, generally at prices higher than those which can be obtained for domestic waters. As more attention is given American waters and to the development of springs as resorts, the sales of foreign waters will diminish.

WHAT THE INTERIOR DEPARTMENT HAS DONE, IS DOING, AND CAN DO FOR THE MINERAL INDUSTRY.

In the course of the foregoing review of our resources, attention has been called to the work of the Department of the Interior in pointing out the extent and value of some of these resources and indicating the ways whereby present wastes in production and utilization could be prevented or minimized and these resources, through wise conservation, be made to contribute more to our national wealth and prosperity, and also to render us practically independent of other countries for raw materials or manufactured products.

To show how the work of the department has benefited each of the many industries that collectively make up the mineral industry of the United States, or to show in how many different ways, under the authority given by Congress, the department can aid in bringing about that wise and efficient utilization of our resources which should be the ideal of our legislators and men of affairs, would involve the compilation of a mass of facts too large to be presented here. The brief outline that is given herewith will, however, serve to show the variety, extent, and vital importance of the work that the department has undertaken for the upbuilding of our mineral industry and the promotion of the national welfare.

WORK OF THE INTERIOR DEPARTMENT FOR THE UTILIZATION OF NATIONAL RESOURCES.

Classification of the public lands:

By topographic and geologic surveys showing what lands still in the possession of the Government are to be classed as mineral lands, and the relation of this latent mineral wealth to existing transportation facilities and to centers of consumption.

By tests of coal, oil, and other minerals to determine their composition, value, and fitness for particular uses.

By investigations of water-power sites and stream flows, to ascertain favorable localities for the development of water power and to determine, by measurements extended through periods of years, the maximum and minimum power that may be obtained from a given stream at a given locality.

Aiding the development of the mineral industry:

By topographic and geologic surveys of mining regions to show the conditions under which the mineral wealth of these regions must be developed, how mining can be done most efficiently, and transportation facilities provided most readily.

By special investigations of the occurrence, geological relations, and extent of mineral deposits to determine with practicable accuracy the value of these deposits and the most efficient methods of mining them.

By collecting complete and accurate annual statistics of the production of mines, quarries, and smelters for the information of producers and consumers of metals and minerals, and for the information of legislators in considering the laws that are to apply to the development of resources for the upbuilding of the mineral industry.

Promoting the conservation of human and material resources:

By investigations of mining and quarrying methods, with special reference to the use of methods that will increase health and safety among miners and quarrymen and lessen or prevent loss of minerals and ores and waste of natural resources.

By investigations of methods of treating minerals and ores with reference to the improvement of health and safety conditions among workmen and the use of more efficient methods of recovering minerals and metals.

By investigations of methods of utilizing our mineral resources with reference to the development of safer and more efficient methods and the elimination of large wastes that are now unnecessarily depleting the mineral reserves of the Nation.

Disseminating authoritative information:

By the distribution of maps and reports showing the progress made in determining the extent and value of the mineral resources and water powers of the Nation, and the ways in which these can be utilized to best advantage—with least danger and with maximum efficiency.

A million miners are employed in the coal mines, metal mines, and quarries of this country and probably 2,000,000 men labor in the affiliated industries that depend directly on the mines. The total value of the minerals and metals produced in this country in 1913 was nearly $2,500,000,000. These figures will serve to show the need of the investigations and work indicated above.

APPENDIX B.

LAND CLASSIFICATION.

Land classification, with progress of coal classification and valuation.

STATUS ON JULY 1, 1914.

State.	Withdrawals outstanding.	Coal lands classified and appraised.	Valuation.	Valuation at minimum price.
	Acres.	*Acres.*		
Arkansas		60,715	$1,473,762	$1,214,280
Arizona	118,718			
California	17,764	7,720	585,086	154,404
Colorado	4,746,663	2,871,920	168,490,129	50,264,182
Idaho	338,452	2,113	51,824	42,260
Montana	14,203,365	4,731,621	116,710,126	94,875,467
Nevada	83,833	5,880	117,600	117,600
New Mexico	5,549,883	958,467	21,257,857	13,544,392
North Dakota	15,202,533	2,099,324	34,062,345	34,062,345
Oregon	26,561	4,672	79,359	67,260
South Dakota		249,897	2,756,427	2,756,427
Utah	5,968,064	1,048,501	44,316,401	14,203,797
Washington	1,380,928	100	3,000	2,000
Wyoming	2,951,156	7,561,929	387,401,082	114,606,837
Total	50,607,920	19,602,859	777,305,698	325,911,280

STATUS ON JULY 1, 1915.

Arkansas		60,715	$1,473,762	$1,214,280
Arizona	118,718			
California	17,643	7,720	585,086	154,404
Colorado	4,609,566	[1] 2,862,863	186,110,238	50,786,637
Idaho	338,452	2,113	51,824	42,260
Montana	12,999,115	4,740,847	116,180,286	94,916,986
Nevada	83,833	5,880	117,600	117,600
New Mexico	5,423,655	960,092	21,252,657	13,560,642
North Dakota	15,202,068	2,099,643	34,065,935	34,065,935
Oregon	26,561	4,672	79,259	67,260
South Dakota		[1] 249,887	2,756,227	2,756,227
Utah	5,666,616	[1] 1,048,343	44,080,759	14,219,517
Washington	847,892	740	16,000	14,800
Wyoming	2,880,155	[1] 7,446,256	385,344,887	112,292,577
Total	48,244,274	[1] 19,489,771	792,114,520	334,209,014

[1] Decrease in coal areas during fiscal year is due to reclassification as noncoal of land previously classified as coal land.

Withdrawals and restorations.

OIL LAND.

State.	Withdrawals outstanding July 1, 1914.	Fiscal year ended June 30, 1915.		Withdrawals outstanding July 1, 1915.
		Withdrawals.	Restorations.	
	Acres.	*Acres.*	*Acres.*	*Acres.*
Arizona	230,400			230,400
California	1,550,848	(1)	43,301	[1] 1,507,547
Colorado	87,474			87,474
Louisiana	414,720			414,720
Utah	1,952,326			1,952,326
Wyoming	522,395	197,073	137,517	581,951
Total	4,758,163	197,073	180,818	4,774,418

[1] Recomputation of outstanding oil withdrawals in California shows that the previously reported areas should be increased by 140,404 acres.

Withdrawals and restorations—Continued.

PHOSPHATE LAND.

State.	Withdrawals outstanding July 1, 1914.	Fiscal year ended June 30, 1915.		Withdrawals outstanding July 1, 1915.
		Withdrawals.	Restorations.	
	Acres.	*Acres.*	*Acres.*	*Acres.*
Florida	120,377	120	280	120,217
Idaho	1,001,276	5,678	40,577	966,377
Montana	130,215	.....	.....	130,215
Utah	36,193	224,558	.....	260,751
Wyoming	1,553,988	42,865	414,037	1,182,816
Total	2,842,049	273,221	454,894	2,660,376

POTASH LAND.

California	94,087	.....	2,880	91,207
Nevada	131,582	119,224	.....	250,806
Total	225,669	119,224	2,880	342,013

Metalliferous classification.

[Northern Pacific Railroad grant lands, Idaho and Montana.]

	Classified prior to July 1, 1914.	Classified during fiscal year 1914–15.	Classified June 30, 1915.
	Acres.	*Acres.*	*Acres.*
Mineral	217,589	6,629	224,218
Nonmineral	324,016	7,911	331,927
Total	541,605	14,540	556,145

Miscellaneous mineral classifications.

[Lands chiefly in present and former Indian reservations.]

	Classified prior to July 1, 1914.	Classified during fiscal year 1914–15.	Classified June 30, 1915.
	Acres.	*Acres.*	*Acres.*
Mineral	148,643	37,294	185,937
Nonmineral	[1] 5,373,875	929,916	6,303,791
Total	[1] 5,522,518	967,210	6,489,728

[1] 1,500,000 acres in Wind River Indian Reservation classified as nonmineral but not reported June 30, 1914.

Power sites withdrawn, restored to entry, and outstanding.

State.	Withdrawals outstanding July 1, 1914.	Fiscal year ended June 30, 1915.		Withdrawals outstanding July 1, 1915.
		Withdrawals.	Restorations.	
	Acres.	*Acres.*	*Acres.*	*Acres.*
Alabama	120	.....	.....	120
Alaska	.....	68,200	.....	68,200
Arizona	190,431	147,000	.....	337,431
Arkansas	17,704	.....	.....	17,704
California	222,769	33,201	280	255,690
Colorado	270,390	.....	.....	270,390
Idaho	272,759	5,082	24,868	252,973
Michigan	.....	1,240	.....	1,240
Minnesota	11,020	.....	.....	11,020
Montana	157,041	510	2,200	155,351
Nebraska	761	.....	.....	761
Nevada	19,087	7,224	.....	26,311
New Mexico	13,577	.....	.....	13,577
Oregon	266,710	656	4,040	263,326
Utah	378,147	2,603	18,160	362,590
Washington	97,537	7,507	988	104,056
Wyoming	73,564	18,911	5,110	87,365
Total	1,991,617	292,134	55,646	2,228,105

Public water reserves.

State.	Withdrawals outstanding July 1, 1914.	Fiscal year ended June 30, 1915.		Withdrawals outstanding July 1, 1915.
		Withdrawals.	Restorations.	
	Acres.	*Acres.*	*Acres.*	*Acres.*
Arizona	1,200	1,918	126	2,992
California	43,524	7,030	.....	50,554
Colorado	480	.....	.....	480
Idaho	.....	5,765	.....	5,765
Montana	.....	1,040	.....	1,040
Nevada	.....	1,464	.....	1,464
New Mexico	1,440	.....	.....	1,440
Oregon	2,500	.....	.....	2,500
Utah	32,707	1,520	240	33,987
Wyoming	81,911	520	.....	82,431
Total	163,762	19,257	366	182,653

Enlarged-homestead designations.

State.	Acreage designated July 1, 1914.	Fiscal year July 1, 1914, to June 30, 1915.		Acreage designated, July 1, 1915.
		Designations.	Cancellations.	
	Acres.	*Acres.*	*Acres.*	*Acres.*
Arizona	24,530,036	501,981	.....	25,032,017
California	850,506	1,146,092	.....	1,996,598
Colorado	24,293,297	539,947	111,082	24,722,162
Idaho:				
Sections 1-5	7,193,220	1,289,074	27,189	8,455,105
Section 6	53,316	33,598	121	86,793
Total	7,246,536	1,322,672	27,310	8,541,898
Kansas	.....	277,605	.....	277,605
Montana	42,997,071	3,766,349	2,607	46,760,813
Nevada	46,303,933	1,264	.....	46,305,197
New Mexico	19,045,996	4,328,545	.....	23,374,541
North Dakota	8,379,764	360,057	314	8,739,507
Oregon	14,869,825	2,066,723	.....	16,936,548
South Dakota	.....	1,756,332	.....	1,756,332
Utah:				
Sections 1-5	6,966,309	181,244	160	7,147,393
Section 6	1,217,106	2,606	680	1,219,032
Total	8,183,415	183,850	840	8,366,425
Washington	3,660,853	384,688	28,654	4,016,887
Wyoming	17,920,496	849,154	.....	18,769,650
Total	218,281,728	17,485,259	170,807	235,596,180

Reservoir sites restored to entry during fiscal year 1915.

State.	Outstanding July 1, 1914.	Restorations during fiscal year.	Outstanding June 30, 1915.
	Acres.	*Acres.*	*Acres.*
Arizona	23,040	.....	23,040
Montana	15,640	.....	15,640
North Dakota	1,569	.....	1,569
Oregon	10,619	.....	10,619
South Dakota	8,542	8,542	.....
Washington	35,943	.....	35,943
Total	95,353	8,542	86,811

APPENDIX C.

NATIONAL PARK STATISTICS.

Appropriations and revenues of national parks for the fiscal years 1906–1915.

	Appropriation.	Revenue.	Total.
Yellowstone National Park:			
1906	$7,500.00	$1,522.50	
1907	7,500.00	2,808.96	
1908	8,000.00	4,699.65	
1909	10,500.00	4,790.20	
1910	8,000.00	5,110.05	
1911	8,500.00	23,420.13	
1912	8,500.00	16,476.38	
1913	8,500.00	21,980.10	
1914	8,500.00	15,439.23	
1915	8,500.00	20,307.40	
	84,000.00	116,554.60	$200,554.60
Yosemite National Park:			
1906	5,400.00	1,000.00	
1907	5,750.00	9,193.04	
1908	30,000.00	14,390.06	
1909	30,000.00	16,051.17	
1910	30,000.00	21,373.18	
1911	62,000.00	35,765.48	
1912	50,000.00	23,855.77	
1913	80,000.00	19,495.83	
1914	125,000.00	23,406.14	
1915	100,000.00	37,019.20	
	518,150.00	201,549.87	719,699.87
Sequoia National Park:			
1906	10,000.00	.....	
1907	10,000.00	159.50	
1908	15,550.00	43.15	
1909	15,550.00	46.57	
1910	15,550.00	121.78	
1911	15,550.00	255.65	
1912	15,550.00	305.16	
1913	15,550.00	353.85	
1914	15,550.00	4,094.21	
1915	15,550.00	1,975.03	
	144,400.00	7,354.90	151,754.90
General Grant National Park:			
1906	2,000.00	.....	
1907	2,000.00	.....	
1908	2,000.00	63.75	
1909	2,000.00	.....	
1910	2,000.00	50.00	
1911	2,000.00	210.64	
1912	2,000.00	173.54	
1913	2,000.00	158.68	
1914	2,000.00	429.64	
1915	2,000.00	560.89	
	20,000.00	1,647.14	21,647.14
Crater Lake National Park:			
1906	3,000.00	.....	
1907–8	7,315.00	25.00	
1909	3,000.00	.....	
1910	3,000.00	11.00	
1911	3,000.00	30.00	
1912	3,000.00	323.00	
1913	3,000.00	784.18	
1914	7,540.00	793.00	
1915	8,040.00	1,359.50	
	40,895.00	[1] 3,325.68	44,220.68
Mesa Verde National Park:			
1907–8	7,500.00	.....	
1909	7,500.00	.....	
1910	7,500.00	.....	
1911	20,000.00	100.00	
1912	7,500.00	898.92	
1913	15,000.00	615.21	
1914	10,000.00	679.00	
1915	10,000.00	637.42	
	85,000.00	[1] 2,930.55	87,930.55

[1] Carried to credit of "Miscellaneous receipts" and "General fund" in Treasury.

Appropriations and revenues of national parks for the fiscal years 1906–1915—Contd.

	Appropriation.	Revenue.	Total.
Mount Rainier National Park:			
1907	$2,500.00	$205.22	
1908	3,000.00	170.00	
1909	3,000.00	1,104.79	
1910	3,000.00	8,953.79	
1911	3,000.00	7,748.48	
1912	5,400.00	5,370.36	
1913	20,000.00	7,301.62	
1914	23,400.00	9,040.10	
1915	51,000.00	12,893.29	
	114,300.00	52,787.65	$167,087.65
Wind Cave National Park:			
1906	2,500.00	.....	
1907	4,400.00	.....	
1908	2,500.00	200.00	
1909	2,500.00	.....	
1910	2,500.00	340.75	
1911	2,500.00	340.00	
1912	2,500.00	675.00	
1913	416.67	528.26	
1914	2,509.00	246.17	
1915	2,500.00	2,492.70	
	24,816.67	4,822.88	29,639.55
Platt National Park:			
1906	.....	37,307.44	
1907	.....	178.00	
1908	.....	7,021.00	
1909	.....	272.00	
1910	.....	2,130.31	
1911	5,000.00	422.75	
1912	10,000.00	165.50	
1913	8,000.00	49.95	
1914	8,000.00	282.81	
1915	8,000.00	241.76	
	39,000.00	48,071.52	87,071.52
Glacier National Park:			
1911	15,000.00	326.88	
1912	60,200.00	1,490.94	
1913	75,000.00	4,652.14	
1914	100,000.00	4,010.71	
1915	75,000.00	4,218.51	
	334,200.00	14,699.18	348,899.18
Rocky Mountain National Park:			
1915	3,000.00	.....	3,000.00
Total appropriations	.....	.....	1,407,761.67
Total revenues	.....	.....	453,743.97
			1,861,505.64

Visitors to national parks, 1908 to 1915.

Name of park.	1908	1909	1910	1911	1912	1913	1914	1915
Yellowstone National Park	19,542	32,545	19,575	23,054	22,970	24,929	20,250	51,895
Yosemite National Park	8,850	13,182	13,619	12,530	10,884	13,735	15,145	33,452
Sequoia National Park	1,251	854	2,407	3,114	2,923	3,823	4,667	7,647
General Grant National Park	1,773	798	1,178	2,160	2,240	2,756	3,735	10,523
Mount Rainier National Park	3,511	5,968	8,000	10,306	8,946	13,501	15,038	35,166
Mesa Verde National Park	80	165	250	206	230	280	502	663
Crater Lake National Park	5,275	4,171	5,000	[1] 4,500	5,235	6,253	7,096	11,371
Wind Cave National Park	3,171	3,216	3,387	3,887	3,199	3,988	3,592	2,817
Platt National Park	26,000	25,000	[1] 25,000	30,000	[1] 31,000	[1] 35,000	[1] 30,000	[1] 20,000
Sullys Hill National Park	250	190	190	[1] 200	[1] 200	300	500	1,000
Hot Springs Reservation	(2)	(2)	120,000	130,000	135,000	[1] 135,000	[1] 125,000	[1] 115,000
Glacier National Park	.....	.....	.....	[1] 4,000	6,257	12,138	14,168	14,265
Rocky Mountain National Park	.....	.....	.....	.....	.....	.....	.....	[1] 31,000
Total	69,703	86,089	198,606	223,957	229,084	251,703	239,693	334,799

[1] Estimate. [2] No record kept.

Receipts collected from automobiles and motorcycles admitted into the national parks during the period from Oct. 21, 1914, to Nov. 17, 1915.

Name of national park, source of receipt, and fee charged per automobile or motorcycle.	Number of permits issued.		Receipts.				Total, automobiles and motorcycles.
			Season 1914.		Season 1915.		
	Automobiles.	Motorcycles.	Automobiles.	Motorcycles.	Automobiles.	Motorcycles.	
Mount Rainier (Wash.):							
Fee, $5 per automobile	1,594		$7,970.00				
Do	3,238				$16,190.00		
Fee, $1 per motorcycle		188		$188.00			
Do		247				$247.00	
Deduction of transmission fees			24.90		50.54		
			7,945.10		16,139.46		$24,519.56
Yosemite[1] (Cal.):							
Fee, $5 single round trip	673		3,365.00				
Do	2,445				12,225.00		
Fee, in Mariposa Grove, $2.50	121				302.50		
Fee reduced, in Mariposa Grove, $1	1,527				1,527.00		
					14,054.50		
Deduction of transmission fees			8.75		41.02		
			3,356.25		14,013.48		17,369.73
Crater Lake (Oreg.):							
Fee, $5 for season automobile and motorcycle permits	8		40.00				
Do	14				70.00		
Fee, $1 for round trip	1,099	18	1,099.00	18.00			
Do	2,011	31			2,011.00	31.00	
			1,139.00		2,081.00		3,269.00
Sequoia (Cal.):							
Fee, $5 for single round trip of automobiles or motorcycles	143				715.00		
Season permits, at $5 each	158		790.00				
Fee, reduced July 16, 1915—							
Round-trip permits, $2.50 each	186	11			465.00	27.50	
Season permits, $10 each	1				10.00		
					1,190.00		
Deduction of transmission fees			2.39		3.94		
			787.61		1,186.06		2,001.17
General Grant (Cal.):							
Round-trip permits, at $1 each	385	12	385.00	12.00			
Do	1,585	40			1,585.00	40.00	
Season permits, at $5 each	7		35.00				
Do	16				80.00		
			420.00		1,665.00		
Deduction of transmission fees			2.93		6.60		
			417.07		1,658.40		
Overpayment on permit of 1914 deducted from 1915 receipts					4.00		
					1,654.40		2,123.47
Mesa Verde (Colo.):							
Fee, $1 for single round trip	34	4	34.00	4.00			
Do	87				87.00		
Deduction of transmission fees			.48		.93		
			33.52		86.07		123.59
Glacier (Mont.):							
Fee, $5 for season permits	18		90.00				
Do	23				115.00		
Fee, $1 for single round trip	249	4	249.00	4.00			
Do	434	26			434.00	26.00	
			339.00		549.00		
Deduction of transmission fees			.48		1.01		
			338.52		547.99		916.51

[1] Motorcycles not admitted into Yosemite and Yellowstone National Parks.

Receipts collected from automobiles and motorcycles admitted into the national parks during the period from Oct. 21, 1914, to Nov. 17, 1915—Continued.

Name of national park, source of receipt, and fee charged per automobile or motorcycle.	Number of permits issued.		Receipts.				
			Season 1914.		Season 1915.		Total, automobiles and motorcycles.
	Automobiles.	Motorcycles.	Automobiles.	Motorcycles.	Automobiles.	Motorcycles.	
Yellowstone[1] (Wyo.):							
Fee, regular trips, 2-passenger automobiles, $5; 5-passenger, $7.50; and 7-passenger, $10. Local trips via northern entrance, 2-passenger, $1; 5-passenger, $1.50; and 7-passenger automobiles, $2 each.							
2-passenger autos—							
Entrances: N. 31, S. 2, E. 18, W. 42, at $5 each	93	.....	.....	.....	$465.00		
5-passenger autos—							
Entrances: N. 276, S. 5, E. 153, W. 301, at $7.50 each	735	.....	.....	.....	5,512.50		
7-passenger autos—							
Entrances: N. 36, S. 1, E. 22, W. 49, at $10 each	108	.....	.....	.....	1,080.00		
Local trips, northern entrance: 1, 2-passenger; 19, 5-passenger; and 2, 7-passenger	22	.....	.....	.....	33.50		
					7,091.00		
Deduction of transmission fees	.....	.....	.....	.....	14.43		
					7,076.57	.....	$7,076.57
Total, for all parks:							
1914	4,225	226	$14,017.07	$226.00	.....	.....	
1915	12,789	355	.....	.....	42,785.03	$371.50	57,399.60

[1] Motorcycles not admitted into Yosemite and Yellowstone National Parks.

Location, area, and characteristics of national parks.

Name.	Location.	When established.	Area (acres).	Private lands (acres).	Visitors, 1915.	Special characteristics.
Yellowstone	Wyoming, Montana, and Idaho.	Mar. 1, 1872	2,142,720	None.	51,895	Wonderful scenery, geysers, boiling springs, mud volcanoes and springs, mountains, grand waterfalls, brilliant-hued canyons, great lake 8,000 feet above the level of the sea; wild animals.
Yosemite	California	Oct. 1, 1890	719,622	19,827	33,452	Mountain scenery, magnificent waterfalls, the Hetch Hetchy and Yosemite Valley, ice-sculptured canyons, glacier lakes, forests.
Sequoia	do	Sept. 25, 1890	151,597	3,716.96	7,647	The home of the "Big Tree" (Sequoia gigantea), growing to a height of 300 feet with a diameter of 30 feet, the bark being 2 feet thick; rugged and picturesque scenery, beautiful cascades and falls, and wonderful caves.
General Grant	do	Oct. 1, 1890	2,536	160	10,523	
Mount Rainier	Washington	Mar. 2, 1899	207,560	18.2	35,166	Glaciers and wild mountain scenery.
Crater Lake	Oregon	May 22, 1902	159,360	2,458.11	11,371	Rugged mountain scenery, beautiful lake within the crater of an extinct volcano, etc.
Wind Cave	South Dakota	Jan. 9, 1903	10,522	160	2,817	Well known by reason of a cavern therein having many miles of galleries and numerous chambers of considerable size containing many peculiar formations.
Platt	Oklahoma	July 1, 1902 Apr. 21, 1904	848.22	None.	[1] 20,000	Noted for its bromide and other springs, the waters of which have medicinal qualities; park well wooded, scenery picturesque.
Mesa Verde	Colorado	June 29, 1906	42,376	880	663	Set aside to preserve the prehistoric ruins of an ancient people; rugged scenery.
Boundary changed	do	June 30, 1913	48,966.4	993		
Hot Springs Reservation	Arkansas	June 16, 1880	911.63	None.	[1] 115,000	Famous for its thermal springs, having wonderful medicinal qualities.
Glacier	Montana	May 11, 1910	981,681	16,668.11	14,265	Famed for its beautiful lakes derived from glaciers, lofty mountains clad with forests, magnificent glacial formations, numberless waterfalls. Game, fish, and birds abound.
Rocky Mountain	Colorado	Jan. 26, 1915	229,062	[1] 3,745	[1] 31,000	Rugged mountain scenery, comprising some of the loftiest snow-covered peaks in the Rocky Mountain States, with a large number of lakes, valleys, and parks.
Sullys Hill	North Dakota	Apr. 27, 1904	780	None.	1,000	Small rugged hills containing prehistoric ruins. Practically a local park.
Casa Grande Ruins	Arizona	Mar. 2, 1889	480	None.	[1] 500	These ruins are one of the most noteworthy relics of a prehistoric age and people within the limits of the United States. Discovered in ruinous condition in 1694.

[1] Estimated.

AN ACT To establish the Rocky Mountain National Park in the State of Colorado, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the tract of land in the State of Colorado particularly described by and included within metes and bounds as follows, to wit: Beginning at the southeast corner of section thirty-four, township three north, range seventy-three west of the sixth principal meridian, Colorado, thence north along the section lines to the northeast corner of section three, said township; thence west to the northwest corner of said section; thence north along the section lines to the northeast corner of section sixteen, township four north, range seventy-three west; thence west to the northwest corner of said section; thence north to the northeast corner of section eight, said township; thence west along the section lines to the northwest corner of section seven, said township; thence north to the northeast corner of township four north, range seventy-four west; thence west along the first correction line north, to the southeast corner of section thirty-six, township five north, range seventy-four west; thence north along the range line to the northeast corner of the southeast quarter of the southeast quarter of section thirteen, said township; thence west to the northwest corner of the southeast quarter of the southeast quarter of section fourteen, said township; thence north to the northwest corner of the northeast quarter of the southeast quarter of section eleven, said township; thence east to the northeast corner of the northeast quarter of the southeast quarter of section twelve, said township; thence south along the range line to the southeast corner of said section; thence east along the section lines to the southeast corner of the southwest quarter of section ten, township five north, range seventy-three west; thence north to the northeast corner of the southwest quarter of said section; thence east to the southeast corner of the northeast quarter of said section; thence north to the northeast corner of said section; thence east to the southeast corner of the southwest quarter of the southwest quarter of section two, said township; thence north to the northeast corner of the southwest quarter of the southwest quarter of said section; thence east to the southeast corner of the northeast quarter of the southwest quarter, said section; thence north to the northeast corner of the northeast quarter of the southwest quarter of said section; thence east to the southeast corner of the northeast quarter of section one, said township; thence north along the range line to the northeast corner of section thirty-six, township seven north, range seventy-three west; thence west along the section lines to the intersection with the west bank of the Big South Cache la Poudre River in township seven north, range seventy-five west; thence southeasterly along the west

bank of said river to the mouth of a tributary of said river, probably in section one, township six north, range seventy-five west; said tributary heading at La Poudre Pass in section twenty, township six north, range seventy-five west; thence southwesterly along the west bank of said tributary to its head; thence across the continental divide to the headwaters of the North Fork of the Grand River, which also heads at La Poudre Pass; thence down the west bank of the North Fork of the Grand River to its intersection with the section line between sections twenty-nine and thirty, township six north, range seventy-five west; thence south along the section lines to the southeast corner of section eighteen, township five north, range seventy-five west; thence west along the section line to its intersection with the west bank of the North Fork of the Grand River; thence down the west bank of the North Fork of the Grand River to its intersection with the section line between sections twenty-five and thirty-six, township four north, range seventy-six west; thence east to the northeast corner of section thirty-six, said township; thence south along the range line to the southeast corner of said township; thence east along the township line to the northeast corner of the northwest quarter of section four, township three north, range seventy-five west; thence south to the southwest corner of the northeast quarter of section nine, said township; thence west along the quarter section line to its intersection with a creek in section seven, said township, this creek being an outlet of Grand Lake, and flowing into the North Fork of the Grand River; thence southerly along the said creek to its junction with the North Fork of the Grand River; thence southerly along the west bank of the North Fork of the Grand River to its intersection with the township line between townships two and three north; thence east along the township line to the southeast corner of section thirty-four, township three north, range seventy-three west, of the sixth principal meridian, Colorado, the place of beginning; all of said above-described tract now being included within the boundaries of the counties of Grand, Boulder, and Larimer, in the State of Colorado, is hereby reserved and withdrawn from settlement, occupancy, or disposal under the laws of the United States, and said tract is dedicated and set apart as a public park for the benefit and enjoyment of the people of the United States, under the name of the Rocky Mountain National Park: *Provided*, That the United States Reclamation Service may enter upon and utilize for flowage or other purposes any area within said park which may be necessary for the development and maintenance of a Government reclamation project.

SEC. 2. That nothing herein contained shall affect any valid existing claim, location, or entry under the land laws of the United States, whether for homestead, mineral, right of way, or any other purpose

whatsoever, or shall affect the rights of any such claimant, locator, or entryman to the full use and enjoyment of his land. Whenever consistent with the primary purposes of the park the act of February fifteenth, nineteen hundred and one, applicable to the location of rights of way in certain national parks and the national forests for irrigation and other purposes, shall be and remain applicable to the lands included within the park. The Secretary of the Interior may, in his discretion and upon such conditions as he may deem wise, grant easements or rights of way for steam, electric, or similar transportation upon or across the park.

SEC. 3. That no lands located within the park boundaries now held in private, municipal, or State ownership shall be affected by or subject to the provisions of this act.

SEC. 4. That the said park shall be under the executive control of the Secretary of the Interior, and it shall be the duty of the said executive authority, as soon as practicable, to make and publish such reasonable rules and regulations, not inconsistent with the laws of the United States, as the said authority may deem necessary or proper for the care, protection, management, and improvement of the same, the said regulations being primarily aimed at the freest use of the said park for recreation purposes by the public and for the preservation of the natural conditions and scenic beauties thereof. The said authority may, in his discretion, execute leases to parcels of ground not exceeding twenty acres in extent in any one place to any person or company for not to exceed twenty years whenever such ground is necessary for the erection of establishments for the accommodation of visitors, may grant such other necessary privileges and concessions as he deems wise for the accommodation of visitors, and may likewise arrange for the removal of such mature or dead or down timber as he may deem necessary and advisable for the protection and improvement of the park. The regulations governing the park shall include provisions for the use of automobiles therein: *Provided*, That no appropriation for the maintenance, supervision, or improvement of said park in excess of $10,000 annually shall be made unless the same shall have first been expressly authorized by law.

Approved, January 26, 1915.

REPORT OF THE COMMISSIONER OF THE GENERAL LAND OFFICE.

REPORT OF THE COMMISSIONER OF THE GENERAL LAND OFFICE.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, September 22, 1915.

SIR: I have the honor to submit a report of the transactions of business in the General Land Office for the fiscal year ended June 30, 1915, including therewith a few suggestions as to new legislation.

AREA OF LANDS ENTERED AND PATENTED.

The total area of public and Indian lands originally entered and allowed during the fiscal year ended June 30, 1915, is 16,861,214.69 acres, an increase of 338,362.57 acres as compared with the area entered during the year 1914.

The area patented during the fiscal year is 13,025,427.976 acres, a decrease of 1,365,643.124 acres as compared with the fiscal year of 1914. Of the above area, 9,594,973.025 acres were patented under the homestead laws, a decrease of 405,661.975 acres, not including homesteads, 32,360.89 acres patented as soldiers' additional entries.

The above patented area also includes the following: Enlarged homesteads, 3,972,381.16 acres; homesteads under the Kinkaid Act, 1,263,184.37 acres; homesteads with coal reservations, 1,435,071.80 acres. Area of Indian fee patents, not included in the above, 202,050.06 acres.

CASH RECEIPTS AND EXPENDITURES.

The total cash receipts for the sales of public land, including fees and commissions on both original and final entries, and sales of Government property in the local offices for the fiscal year 1915 were $3,786,319.54 (1914, $4,256,102.96), a decrease of $469,783.42. Miscellaneous receipts were as follows: From sales of Indian lands, $1,556,630.97 (1914, $1,884,802.77); depredations on public lands, $31,203.54; depredations on Indian lands, $38.33; leases, power sites, etc., act of February 15, 1901, $1,116.21; copies of records, plats, etc., made at General Land Office, $14,738.82, and at 13 surveyors generals' offices, $4,900.79, making the aggregate cash receipts of this bureau during the fiscal year 1915, $5,394,948.20 (1914, $6,148,367.63), a decrease of $753,419.43.

The total expenses of district land offices for salaries and commissions of registers and receivers and incidental expenses during the fiscal year ended June 30, 1915, were $828,865.71, a decrease of $24,832.89. The aggregate expenditures and estimated liabilities of the public land service, including expenses of district land offices and surveys made were $3,008,996.31, leaving a net surplus of $2,384,922.61 of receipts over expenditures.

THE FIELD SERVICE.

The amount appropriated for the maintenance of the field service for this year was $475,000, a decrease of $25,000 from that allowed for the year 1914. This made necessary a reduction in the field force. The average number of agents employed during this year was 106, a decrease of 13 from the preceding year. In addition to these employees, the cost of the maintenance of the offices of the chiefs of field division, with the clerical assistance incidental thereto, is met from this appropriation.

The total amount of cash collected and turned into the Treasury as the result of the work of the special agents during the fiscal year was $90,799.24. Of this amount, $34,014.40 was accepted as settlement for timber trespass and $10,302.66 was realized from timber sales; $46,482.18 was recovered by civil and criminal action brought through the Department of Justice in cases of depredations on the public lands and violations of the public-land laws.

As a result of investigations by the field service, 530,841.90 acres have been restored to the public domain. Of this amount, 258,240 acres represent fraudulent entries (taking an average of 160 acres to each entry) canceled as the result of proceedings on special agents' reports; 266,774.40 acres were restored to open range on abatement of unlawful inclosures without suit.

Special agents have made examinations and reports on 20,299 entries, 5,501 of which were adverse and 14,798 were favorable. In addition to the reports of special agents, 200 adverse reports and 1,011 favorable reports have been received from forest officers on entries within national forests.

During the year 123 civil suits were recommended Two hundred and fifteen suits have been tried, 133 of which were won and 82 lost. As a result, $42,919 was recovered and 41,695.50 acres were restored to the public domain, 35,868 acres of which had been unlawfully inclosed.

Of the 73 criminal cases disposed of during the year, 33 resulted in convictions, and in these cases fines amounting to $7,552 were imposed, as well as 23 prison sentences.

At the close of the fiscal year, 638 civil cases and 174 cases wherein criminal prosecution was recommended were pending before the Department of Justice.

Effective July 1, 1915, a consolidation of the field service was directed; the Los Angeles field division was abolished, the State of Arizona being consolidated with the Santa Fe (N. Mex.) field division and the Los Angeles district being placed under the jurisdiction of the San Francisco field division. The Duluth (Minn.) field division was also abolished; the State of South Dakota was placed under the jurisdiction of the Cheyenne (Wyo.) field division, and the administration of the work in the States of North Dakota, Minnesota, Wisconsin, and Michigan was placed under the chief of field service of this office.

By these changes the expense incident to the maintenance of these two headquarters is saved, without impairment of efficiency in the administration of the work.

THE OIL LAND SITUATION.

The investigation of locations and filings on lands withdrawn as oil in California, Wyoming, and Louisiana constitutes one of the most important and pressing branches of the work of the field service.

All these filings, entries, and selections must be investigated to determine the rights, if any, of applicants and locators. As to those who assert claims under the mining laws, the investigation must go, not only into the bona fides of the locations and applications for patent, but also into the question as to whether or not the claimants were in diligent prosecution of the work leading to discovery prior to the withdrawal of the lands. It is important that the rights of all who assert any claims in these withdrawn areas be promptly determined in order that the lands may not be drained of their petroleum contents by those having no rights thereto, and in order that it may be definitely determined what lands remain subject to disposal by the Government.

In California alone there are over a million and a half acres within the withdrawn area, of which about a million acres are patented lands. More than one hundred thousand acres are embraced in pending filings, selections, or entries, and there are over four hundred thousand acres for which no filings have been presented to the local land office, but which are doubtless covered by mineral locations recorded in the various mining districts.

During the year, 11 mineral and 44 agricultural claims, embracing 7,060 acres, have been patented; adverse proceedings have been instituted challenging the validity of 41 mineral and 42 agricultural claims, with an acreage of 14,803; 15 mineral and 39 agricultural claims, embracing 10,887 acres, have been canceled; there are now

pending, under various stages of investigation and action, 145 mineral claims, embracing 34,547 acres, and 340 agricultural claims with an acreage of 54,029.

While I anticipated that at the close of this fiscal year practically all the investigations in California on pending applications would be completed, my hope has not been fully realized. However, the most recent reports indicate that in a few months we shall be in a position to take action on nearly all these pending cases. Much has been accomplished during the year, considering the magnitude of the work, the difficulties involved, and the necessity for exhaustive investigation of intricate details; the cases are being closed up and reports are now coming in which will afford a basis of action. The investigating force has been still further increased over that which operated last year and the chief of field service is in San Francisco in personal supervision of the work.

In addition to the examination of claims pending before the Land Department, the investigation of lands and securing evidence to predicate action by the Department of Justice to recover by suit valuable oil lands the title to which has been secured by fraud, has been pushed. As the result, four suits have been instituted against the Southern Pacific Railroad Co. to recover title to 56,579 acres. With those already instituted, there are now eight suits pending in the Federal courts in California, involving 159,580 acres.

Six suits, involving 877 acres, have also been brought to recover for trespass committed in violation of the Executive withdrawal orders. In most of these cases operations have been continued under receiverships ordered by the court in order to conserve the property pending definite determination of title.

In Wyoming there are about 600,000 acres now under withdrawal, of which about 65,000 acres are patented. Since September 27, 1909, the date of the first withdrawal, 11 mineral entries, embracing 1,500 acres of withdrawn land, have been passed to patent after investigation by the field service. Three of these entries were canceled in part as the result of investigations which disclosed the use of "dummy" locators, the area canceled amounting to 290 acres. Investigations have been made of a number of pending applications, and also of locations for which no applications for patent have been filed.

The situation regarding the lands withdrawn in Wyoming is quite different from that in California, for the reason that Wyoming is the newer field and there are very few locations on which operations are being conducted for which application for patent had not been filed. In California, many locations are held under the possessory title only without steps being taken to procure patent. The situation in Wyoming is complicated by reason of the fact that while active

operations in the field are comparatively recent, yet a considerable number of locations were made many years prior to active operations, and adverse claims under section 2326 of the Revised Statutes have been filed against most of the applications for patent. Thus all action looking toward the issuance of patent is stayed pending determination of the possessory title.

Three trespass suits, involving 680 acres, have been brought by the Department of Justice as the result of investigations made by the field service in the withdrawn areas.

The area of unpatented lands embraced in the withdrawals in Louisiana is relatively small and the interest of the Government in these areas is largely involved in the proceedings known as the Ferry or Caddo Lake case which is dealt with in another part of this report.

The general situation has been greatly clarified by the decision in the case of the United States *v.* Midwest Oil Co. (236 U. S., 459), which upheld the power of the Executive, in the absence of specific authority from Congress, to withdraw lands from appropriation and to reserve them for public purposes. The decision of Judge Bledsoe, rendered in July, 1915, in United States *v.* Pacific Midway Oil Co. et al., in the southern district of California, was the first judicial expression as to what constitutes diligent prosecution of work leading to a discovery so as to except a claim from the force and effect of an Executive withdrawal.

OIL CONTRACTS.

The act of August 25, 1914 (38 Stat., 708), affords temporary relief to applicants for mineral patent for lands valuable for oil and gas which are embraced in orders of withdrawal. Under this act, the Secretary of the Interior is vested with the discretion of entering into contracts providing for the disposition of the oil or gas produced from the tract embraced in the application for patent, or any portion of it, upon such terms and conditions as he may prescribe.

After careful consideration of the situation in the various oil fields a form of contract was drawn up which is clear in its terms and free from hampering and technical restrictions, yet withal, due regard is had for the interest of the Government.

It was concluded that one-eighth of the gross proceeds would be a fair and just proportion to be placed in escrow, to be paid over to the United States in case the application for patent was denied. The seven-eighths allowed to the operator is regarded as equaling the expense of operation plus a fair return upon the investment. However, the right is reserved to increase the royalty exacted at any time, should it be deemed proper and advisable to do so.

During the year 15 applications for contracts have been considered and allowed. The present prospects are that a considerably greater number will be presented during the coming year.

"SUNK LANDS" AND "LAKE LANDS" IN ARKANSAS.

The legal status of the cases involving the "sunk lands" and "lake lands" in northeastern Arkansas has not been changed since the previous annual report. An appeal was taken, however, by the defendants in the test suit of the United States *v.* Lee Wilson & Co. et al. (214 Fed., 630). The appeal has been argued and a decision is expected during the early fall. Five similar suits, involving so-called Buford, Clear, Flat, Grassy (including Campbells' Old Field Lake), and Walker Lakes, have been prepared and are now being prosecuted by the Government. It has not been definitely determined whether or not it will be necessary or advisable to institute other suits to quiet title to all of the various tracts of the "sunk lands" and "lake lands" in northeastern Arkansas, claimed by the Government. That question will probably be determined soon.

On November 18, 1914, supplemental plats of townships 12 and 13 N., range 9 E., and of townships 11 and 12 N., range 10 E., were approved. Approximately 8,822 acres within those townships, situated in Mississippi county, had been erroneously shown upon the original plats as Carson, Hickory, and Tyronza Lakes. The lands within those so-called lake areas were opened to homestead entry February 10, 1915.

The supplemental plats of townships 15 and 16 N., range 6 E., of townships 15, 16, and 17 N., range 7 E., and of township 17 N., range 8 E., were approved May 24, 1915. Approximately 16,990 acres, situated in Craighead and Greene counties, erroneously shown upon the original plats as "St. Francis River sunk lands," "waters of the St. Francis River," and "Bagwells Lake," were opened to homestead entry July 16, 1915.

In the completion of the surveys of the areas above referred to, the promise made in the report of last year that the work of surveying, which had then been directed, would be finished this year, has been fulfilled. The surveys of the "sunk lands" and of the above mentioned lake lands have been completed, and all of the lands within those areas, comprising approximately 87,000 acres, of what will be, when developed by cultivation, among the most valuable lands in the State, are now either embraced within homestead entries or are subject to entry.

On May 1, 1914, the Department of the Interior rendered a decision in which it held that portions of sections 1 and 12, township 8 N., range 8 E., and of section 7, township 8 N., range 9 E., comprising about 571 acres of the eastern end of the area shown upon those plats as Wappanocea Lake, are public lands which were erroneously omitted from the original surveys. Those areas were surveyed during the past year and supplemental plats were approved on July 21, 1915.

The statement was made in the report for the fiscal year ended June 30, 1914, that on July 16, 1914, the Department of the Interior had rendered a decision in which it held that the title to the lands within the areas of so-called Big, Brown, and Round Lakes, is vested in the Government, and that the survey of the public lands within those areas had been directed. Since then the surveys of those so-called lake areas have been made and on July 21, 1915, the supplemental plats of township 11 N., range 8 E., and of township 14 N., range 11 E., within which the lands in so-called Brown and Round Lakes are situated, comprising approximately 1,033 acres in Crittenden and Mississippi counties, were approved. The supplemental plats of townships 14, 15, and 16 N., range 9 E., and of townships 15 and 16 N., range 10 E., within which so-called Big Lake, comprising approximately 22,513 acres of public lands in Mississippi county, is situated, have been nearly completed. It is expected that those plats will be ready for approval within a few weeks. The public lands within the areas of so-called Big, Brown, and Round Lakes will be opened to homestead entry at a comparatively early date.

The permanent water area of Big Lake is said to be, without exception, the finest refuge for ducks and other wild fowl in the Mississippi River Valley. Many persons, locally known as "market hunters," have engaged for years in the practice of annually shooting vast numbers of the birds and of shipping them to the markets in the neighboring States. This practice has threatened the extermination of the birds, and as a result stringent State and Federal laws have been enacted, and the conditions have been improved somewhat. In order that the above referred to bird refuge shall not be further disturbed, this office recommended that a strip of land bordering upon the water area of Big Lake, together with all islands within the lake, be set apart as a bird reserve. The recommendation met with the approval of the United States Biological Survey, and on August 2, 1915, the President issued an Executive order creating the Big Lake Bird Reservation.

Hearings have been held at which testimony was taken for the purpose of determining the question of title to the areas locally known as Dismal, Hudgens, and Mills Lakes. Similar hearings have also been ordered involving the areas locally known as Barfield, Carters, Cypress, Golden, Long, Swan, Youngs, Grassy, and Round Lakes (there are two so-called Grassy and Round Lakes in northeastern Arkansas, and the Grassy and Round Lakes mentioned in this paragraph are different areas from those referred to as Grassy and Round Lakes in the preceding paragraphs), and certain fragmentary tracts within "Little River," "Left Hand Chute of Little River," and "Right Hand Chute of Little River." Those hearings will be held during August, 1915. Decisions involving the question of title to all

of the so-called lake areas mentioned in this paragraph will probably be rendered during the fiscal year ending June 30, 1916. When the question of title to those areas shall have been determined, there will probably be very little work of this character in the State of Arkansas remaining for action by this office.

On July 16, 1914, this office rendered a decision in which consideration was given to the question of whether or not those portions of the "sunk lands" and "lake lands" situated within sections 16, originally school sections, had been relinquished by the State of Arkansas to the United States under the terms of the so-called compromise act of April 29, 1898 (30 Stat., 367). Homestead entries had previously been allowed for certain of the lands within those sections. It was decided that the State had relinquished its interest in those lands. Notice to that effect was served upon the entrymen and also upon the State and the right of appeal was granted to the latter. An appeal has since been taken, and the case is now pending before the Department of the Interior. Approximately 2,295 acres are involved.

"FERRY" OR "CADDO LAKE" OIL LANDS IN LOUISIANA.

The status of the "Ferry" or "Caddo Lake" oil lands in T. 20 N., R. 16 W., L. M., Louisiana, was given somewhat in detail in the annual report for 1914. Since the publication of that report the work of the investigators detailed to make the special investigations has been completed, and the case was resubmitted to the Department of the Interior on July 9, 1915.

Owing to the importance of the issues and the magnitude of the interests involved, the investigations were made along the lines of the most careful and minute scientific research and were probably as exhaustive as any investigation ever conducted in a single case by this office.

The work of the investigators consisted principally in ascertaining the mean high-water level above mean Gulf level of the so-called lake in 1812, the date of the admission of Louisiana to statehood in 1839, the date of the original surveys, and in 1913 and 1914, the period during which the investigations were made; in reestablishing the original meander line of 1839, and the boundary line between the States of Louisiana and Texas which was established by the boundary commission during 1840 and 1841; in reestablishing lost corners and adjusting and permanently monumenting the angle points of the original meander line; in monumenting, identifying, and recovering corner points by iron posts, witnessed by new bearing trees; all of which amounted to a regular resurvey of the exterior and subdivisional meander lines of the township. The work of the ecologist and of the geologist consisted in making examinations bearing upon the

soil and tree conditions and the effect which the ponding of the waters had upon those conditions during various periods of pre-raft, raft, and post-raft developments from the latter half of the eighteenth century to the present time. Much evidence was collected which materially assisted the surveyors in reestablishing correctly the monuments of the original survey and which will enable the department to determine the issues of fact involved in the case. The most striking feature of the Government investigations is the fact that all of the investigators essentially agreed as to the salient points upon which a decision of the issues must be based. The work of the investigators was closely followed by the various parties whose interests are adverse to the Government, through their attorneys, geologists, ecologists, engineers, and surveyors.

Maps showing the topographical and hydrographical features, and plats showing the ecological conditions of the so-called lake area based upon the investigations, have been prepared. The location of all oil wells within the areas designated upon the original plat as "Ferry Lake" have been shown.

The "Ferry Lake" case was resubmitted to the department with substantially the same recommendations as those made by this office in a letter to the Secretary of the Interior, dated January 10, 1913. The attorneys for the applicants for the surveys, and the attorneys for the protestants have been accorded further opportunities to be heard by the department, and a hearing will be held some time during the early fall.

SUITS AFFECTING LANDS GRANTED TO RAILROADS.

On June 21, 1915, the United States Supreme Court rendered a decision in the case of the United States *v.* Oregon & California Railroad Co. et al. (35 Supreme Court Reporter, 908, Advance Sheets). The suit was in equity and was originally instituted in the United States District Court for the District of Oregon, suit No. 3340, pursuant to the joint resolution of Congress of April 30, 1908 (35 Stat., 571), authorizing and directing the Attorney General to institute any and all suits that might be deemed adequate to enforce any rights or remedies that the United States might have growing out of the grants made by the acts of July 25, 1866 (14 Stat., 239), and May 4, 1870 (16 Stat., 94), to aid in the construction of the Oregon & California Railroad and the Coos Bay wagon road. It was in the nature of a forfeiture suit involving the portions of the grant remaining unsold, because of the failure of the company to comply with the provisions of the act of April 10, 1869 (16 Stat., 47), which required that the granted lands should be sold to actual settlers only, in quantities not exceeding 160 acres to any one purchaser, and for a price not exceeding $2.50 per acre.

The decision rendered by the United States Supreme Court reversed the decree of the lower court and refused to declare the grant forfeited, principally on the ground that the conditions under which the grant was made did not amount to conditions subsequent, the unfulfillment of which would invalidate the contract, but were enforceable covenants which the Government could require the grantee to perform. Among other things, the court decided, however, that the lands involved in the suit invite now more to speculation than to settlement, and in view of that fact it enjoined the railroad company from making any disposition of the lands or of the timber upon the lands until Congress shall have had a reasonable opportunity to provide by legislation for such disposition as it may deem fitting under the circumstances, and at the same time secure to the defendants all the value which the granting acts conferred upon the railroads. If Congress does not act, the defendants are granted the privilege of applying to the United States district court within a reasonable time, not less than six months from the date of the entry of the decree, for a modification of so much of the injunction as affects the disposition of the lands and the timber thereon.

During July, 1915, the United States District Court for the District of Oregon rendered a decision in the case of the United States against the Southern Oregon Co., suit No. 3701, which had been instituted some time prior to 1913. This suit involved the lands which had been granted to the Coos Bay Wagon Road Co., and which had been acquired through mesne conveyances and by foreclosure proceedings by the Southern Oregon Co. Previously four other suits had been instituted involving lands contained in an overlap of the grants to the road company and to the Oregon & California Railroad Co., and also involving lands outside of the limits of the road grant which had been patented to the road company by mistake. Demurrers interposed by the defendants were sustained in three of those suits, and in the fourth a decree favorable to the Government was rendered.

The suit against the Southern Oregon Co. was held by the court not to have been barred by the suits previously instituted, and a decree was granted in conformity to the decree rendered by the United States Supreme Court in the case of the United States *v.* Oregon & California Railroad Co. et al.

The total area of the lands involved in the suit against the railroad company amounts to about 2,300,000 acres. Of this area approximately 1,800,000 acres comprise timber lands, situated in 18 different counties of the State of Oregon. It has been estimated that the amount of timber upon these lands is at least 75,000,000,000 feet, board measure, said to be worth from $50,000,000 to $100,000,000.

An area comprising 91,153 acres within the wagon-road grant, situated in Douglas and Coos Counties, Oreg., was involved in the

suit against the Southern Oregon Co.; 86,493 acres have been cruised, and it is estimated that there is approximately 2,359,000,000 feet, board measure, of timber valued at about two and a quarter million dollars within the cruised area.

Several plans have been suggested for the disposition of the lands involved in the above-mentioned suits, with a view to recommending legislation to Congress to make the disposition suggested by the courts effective. The subject is under consideration but a definite plan has not yet been formulated, but one probably will be suggested to Congress when it meets again, either by the Department of the Interior or by the Department of Justice.

On August 1, 1914, Congress appropriated $25,000 for the maintenance of a fire patrol on the lands involved in the suit of the United States against the Oregon & California Railroad Co. During the fiscal year ended June 30, 1915, the patrol was conducted under the supervision of the Forest Service, Department of Agriculture, and by the State and local forest associations in accordance with an agreement entered into by the Departments of the Interior and Agriculture. According to the reports received by this office, about 580 forest fires were fought on areas approximating 86,000 acres, and those fires were extinguished with the salvage of all excepting about 9,000,000 to 10,000,000 feet of timber, estimated to be worth from $9,000 to $10,000. Had the lands not been protected by a fire patrol, the timber losses from forest fires would undoubtedly have been very large.

On March 3, 1915, another appropriation of $25,000 was made by Congress for the continued maintenance of the fire patrol. The Forest Service has been requested to continue its supervision over the administration of the work, and the patrol for the fiscal year ending June 30, 1916, is being conducted by it.

The act of August 20, 1912 (37 Stat., 320), provided among other things, that the Attorney General might, in his discretion, compromise any suit that had been or might thereafter be instituted against purchasers from the Oregon & California Railroad Co., involving lands purchased prior to September 4, 1908, under stipulation with the defendant or defendants, or their successors or assigns, to the effect that a decree or decrees be entered adjudging the lands purchased to be forfeited to the United States; and that if the defendant or defendants or their successors or assigns should, within six months from the entry of the decree, file a copy thereof with the Secretary of the Interior, accompanied by an application to purchase all the lands covered thereby, and should pay to the Treasurer of the United States $2.50 per acre therefor, the Secretary of the Interior should cause patents to be issued to the purchaser, conveying all the right, title, and interest of the United States in and to all of said lands.

The Attorney General has reported 40 suits that have been compromised under the provisions of the act of August 20, 1912, and the applications for patents have been filed by and approved to the purchasers and patents have been issued for the lands involved in those compromises. The estimated area of such lands is 371,535.90 acres for which $928,840.18 was paid. It is believed that the above-mentioned suits are all of the suits that will be compromised.

On June 22, 1914, the Supreme Court of the United States handed down a decision in the case of Burke *v.* The Southern Pacific Railroad Co. (234 U. S., 669), wherein it was held that the practice of the General Land Office of reserving from railroad patents all mineral theretofore or thereafter discovered was unwarranted; that it was the duty of the Interior Department to definitely determine the character of the land before the issuance of patent.

The Burke *v.* Southern Pacific Railroad Co. decision has largely added to the duties of the General Land Office in that it is now necessary for it to finally determine whether or not lands sought to be patented are or are not mineral lands. This office is, however, now enabled to act understandingly upon railroad lists pending for patent, as is more fully demonstrated by later pages of this report showing the areas of lands patented to railroads.

On March 2, 1901, a suit was instituted in the United States District Court for the western district of Louisiana against the New Orleans Pacific Railroad Co. et al. to regain the titles to certain lands held to have been erroneously patented to that company, on the ground that they were excepted from the operation of the grant by the proviso to section 2 of the act of February 8, 1887 (24 Stat., 391). Action was not taken in that case for a number of years, but during the past two years investigations have been made by special agents of this office, detailed to assist the Department of Justice, of the claims involved in that suit, resulting in voluminous correspondence, especially during the past year, when efforts were made in the interest of the settlers to compromise a number of the cases. As a result many claims have been practically settled in a manner beneficial to the settler, and the remaining cases involved in the suit will be eliminated by reason of the institution of new suits for the benefit of the settlers. It is expected that about 100 old cases which have been held suspended in this office and which are involved in the aforesaid suit will soon be released and closed.

PUBLIC LAND SURVEYS.

In the year that is now closed the work undertaken and accomplished in all branches of survey operations is a matter of extreme gratification, the figures showing an area of accepted original sur-

veys of 11,988,387 acres, and 2,350,962 acres of resurveys, a grand total of 14,339,349 acres.

The aggregate acreage of accepted surveys thus shown is greatly in excess of that of previous years, being much larger than in any year within the last two decades. The greatest amount of field work has been accomplished in Montana, due to increased demands from prospective settlers and due to the large areas of surveys made within railroad grant limits. In the States of Arizona and New Mexico there have been unusually large areas surveyed, the increase having been brought about by the provisions of the acts admitting these States into the Union, which allowed the governor of each State to secure the withdrawal from adverse settlement of extensive areas of unsurveyed land, pending the survey thereof and selection by the State of the lands to satisfy their grants for schools and other institutions under the enabling acts. Several million acres have been thus withdrawn and have been surveyed, or are in process of being surveyed. For this purpose the former allotments from the regular annual appropriations to these two States for surveys have recently been more than doubled.

In the survey of small holding claims in New Mexico there has been very marked progress. This important work has heretofore been confined to limited areas, and only a small portion of the allotment to New Mexico has been diverted to the surveys of these tracts. During the last fiscal year the allotments for small holding claims have been increased and definite sums set apart for the work, besides providing for a special force of surveyors who, by reason of their experience and ability, are enabled to accomplish greater results, thus making considerable more progress in this work than in previous years.

Authorization of surveys on the application of settlers have been liberalized within the last fiscal year. Heretofore in the execution of such surveys the rule adopted limited the acreage surveyed in the township proportionately to the number of settlers therein. But in view of the increase of the funds appropriated by Congress for surveys and resurveys of public land, a survey of the entire township is now made, provided there is sufficient arable land to justify the survey. In this way it is thought the surveys can be more rapidly extended over the unsurveyed public domain, and the development and settlement of the country encouraged and hastened, at the same time effecting a more satisfactory subdivisional survey than would be the case if portions of the township were surveyed at successive intervals of time.

RESURVEYS.

The work of resurveying the 303 townships in Wyoming and the 147 townships in Colorado, authorized by the act of May 29, 1908 (35 Stat., 465, 471), has necessarily been slow, for the reason that said act not only failed to carry with it a special appropriation therefor, but prohibited for this additional work an increase in the amount annually apportioned to the district of Wyoming from the regular appropriation for surveying the public lands. Substantial progress has, however, been made in the execution of these resurveys during the past surveying season, especially in the last-named district.

In the disposition of petitions for resurvey under the act of March 3, 1909 (35 Stat., 845), which provides for resurveys in the discretion of the department, it has been found advisable to adopt a regular form of proceeding for presenting such applications. This was necessary because resurveys are almost invariably a source of contention, and, further, so many applications have heretofore been made not based on any detailed statement of facts from which a fair conclusion could be arrived at, as to the necessity for such resurvey.

The rule now adopted requires a majority of the settlers in each township to join in the application, in addition to the indorsements of the entrymen and owners, including the State, whose holdings represent the major part of the area entered or patented, with a description, opposite each name, of the lands actually occupied, entered, or owned, and a statement as to whether the applicant is a settler, entryman, or owner thereof. Where an entryman or owner, including the State, has failed for any reason whatsoever to join in the application, evidence of service of notice upon him for at least 30 days in advance of the filing of the application is required.

Applications for resurvey of each township also require evidence in the form of an affidavit, preferably from the county or other competent surveyor, showing in detail that the original survey has been obliterated to such an extent as to make it impracticable to apply the suggestions of the circular issued by this office, for the necessary restorations of the lines and obliterated corners, in the proper identification of the legal subdivisions occupied by the present or prospective entrymen.

These regulations are working no hardship in cases where the applications for resurvey are of a meritorious character, and serve to eliminate the expense of the field examination where the applicants can not show a prima facie necessity for resurveying their lands.

SURVEYS WITHIN RAILROAD LAND GRANTS.

This work has progressed very favorably during the past fiscal year. It is estimated that more has been accomplished during the year, and the area of surveyed lands greater this season than in any

previous season. Approximately 3,000,000 acres were surveyed, employing 43 surveying parties.

The matter of funds for this purpose, which presented an important handicap, owing to the comptroller's decision as to their applicability, has been satisfactorily settled and in the future there appears to be no obstacle toward a speedy completion of all surveys within granted limits. This has been made possible by the cooperation of the railroad companies whose grants are subject to survey under the so-called "compulsory" act of June 25, 1910. These companies have found it to their best interests to have the surveys completed under the "voluntary" act (Feb. 27, 1899) instead of under the "compulsory" act (June 25, 1910). The administration of the fund is thus simplified and the completion of the work of surveying the lands in the entire grant in the near future is now assured.

When the "compulsory" act went into effect in 1910, its provisions applied to the unsurveyed land within railroad limits in Montana, Idaho, Washington, Oregon, California, Nevada, Arizona, and New Mexico. By the close of the present surveying season it is expected that the grant lands will all have been surveyed in New Mexico, Nevada, Idaho, Washington, and the greater part of Montana, leaving for the next surveying season the remainder of the Montana lands and those in California, Arizona, and Oregon.

SURVEY OF FOREST HOMESTEADS.

An entryman within a national forest under the provisions of the act of June 11, 1906 (34 Stat., 233), whose lands are described by metes and bounds, is required by the act to present when he applies to make final proof, "a plat and field notes of the lands entered, made by or under the direction of the United States surveyor general." Under authorizing statutes such plats and field notes and the survey they represent have, since the act of March 4, 1913, been made under the stated direction by employees of the Forest Service, without expense to entrymen. That service has heretofore given attention chiefly to entries maturing to final proof and, on the requests of district foresters, surveyors general have issued during the year special instructions for 1,039 surveys for such entries for assignment to accredited employees of that service. The total number of special instructions issued for such surveys under the stated act of 1906 is now 2,354.

During the year surveyors general have approved and transmitted to this office for examination and acceptance returns of 328 such surveys. In the same interval this office has accepted 244 returns and authorized the filing of the requisite plats in local land offices for use of the entrymen at final proof.

INDIAN SURVEYS.

Upon application by the Commissioner of Indian Affairs, surveys of lands in Indian reservations are executed and plats constructed under the direction of this office; during the past fiscal year surveys and resurveys of 54 townships have been accepted, including lands in the Navajo, Duck Valley, Wind River, Fort Duchesne, Yakima, Fort Spokane, and Uncompahgre Reservations, and in addition the surveys of 21 villa sites in the Flathead Reservation and 8 town sites on various other reservations have also been completed and accepted.

IMPERIAL VALLEY SURVEYS.

During the fiscal year ended June 30, 1915, this office brought to a satisfactory conclusion the long-standing controversy over the identification of lands lying north of the third standard parallel in Imperial Valley, Cal. The title to half of these lands, or to all odd-numbered sections within the area, had passed to the Southern Pacific Co. by reason of their inclusion within the primary limits of the grant of said company under the survey of 1856. Title also vested in the State of California to sections 16 and 36 in the townships referred to by the same survey, and some patents had also been issued under other forms of law, such as homestead, desert, and lieu selection, to private individuals. In addition a considerable proportion of the valley lands were embraced in desert-land entries and a few scattering homestead entries. The survey of 1856 had become completely obliterated because of the perishable nature of a great majority of the corner monuments, the loose and shifting character of the soil, and the lapse of time since the survey was executed, and therefore as settlement began to extend north of the third standard parallel, question arose in the minds of interested parties as to the location of their lands. Physical evidence of the original survey had ceased to exist and claimants resorted to various methods of survey in an attempt to relocate their lands, with resulting conflicts of position and discrepancies in area. Furthermore, certain of the valley lands had been withdrawn from entry under the reclamation act of June 17, 1902, and the matter of their early restoration was under consideration by this office.

After a thorough consideration of the various features of the case, a detailed investigation in the field of survey conditions in the valley was decided upon, with a view to developing a basis for a resurvey that would satisfy all conditions. Accordingly this investigation was made in February, 1915, with the result that the department directed a resurvey in township 12 S., range 12 E.; townships 10, 11, and 12 S., ranges 13 and 14 E.; and townships 11 and 12 S., range 15 E., S. B. M., covering an area of approximately 170,000 acres. These resurveys were completed early in May, 1915.

A similar condition of the original surveys, that is, obliteration, was found upon investigation to exist in the area immediately east of and adjoining the Imperial Valley proper, and therefore under departmental approval of February 15, 1915, resurveys under the provisions of the act of March 3, 1909, of townships 13, 14, 15, 16, and 17 S., range 17 E.; townships 15, 16, and 17 S., range 18 E.; and townships 16 and 17 S., range 19 E., S. B. M., covering an area of approximately 190,000 acres, were authorized. These resurveys were completed in June, 1915.

To the west of and adjoining Imperial Valley, resurveys in townships 13, 15, and 16 S., ranges 9 and 10 E., and township 14 S., range 10 E., were commenced under department authorization dated January 26, 1915, and the resurvey of about 90,000 acres accomplished. Owing to the excessive heat in June and its effect on both men and animals, it was considered more economical to defer the completion of the surveys until fall. This work will be resumed about the 1st of October and completed about the middle of November.

MISCELLANEOUS FRAGMENTARY SURVEYS.

During the fiscal year 15 islands and other fragmentary areas omitted from the original surveys in Florida, Michigan, and Minnesota have been surveyed, the plats completed, and the lands opened to entry; 18 similar areas in Alabama, Florida, Michigan, and Mississippi have been surveyed, the plats of which have not yet been completed. The surveyors have also made seven field investigations of swamps and overflowed lands and tide lands in Florida, Louisiana, and Mississippi, comprising in all about 75,000 acres, for the purpose of determining the character of same with relation to the questions of title involved. The aforementioned surveys and examinations embrace fragmentary areas of all sorts of character and various quantities, mostly omitted from the original surveys, title to which rests largely upon their character at the dates of the admission of the States into the Union and at the passage of the swamp-land laws.

The fact that the above fragmentary surveys (including the Arkansas "lake" and "sunk land" surveys) are all by law controlled directly by the Commissioner of the General Land Office as ex officio United States Surveyor General, and that the field work concerning same is of ever-changing and complicated character, has warranted the detail of one of the supervisors of surveys to this special duty, with the help of such surveyors as may be needed from time to time. This arrangement has resulted in bringing the fragmentary surveys and examinations up to date, with prompt results comparing favorably with the more extensive surveys in the regular western districts.

REVISION OF THE MANUAL OF SURVEYING INSTRUCTIONS.

During the past fiscal year a board of five members embracing employees of both the office and field branches of the surveying service has been created, to revise the "Manual of Surveying Instructions for the Survey of the Public Lands of the United States." The last revision is known as the Manual of 1902, since the publication of which several important changes have been made in the surveying practice, including the adoption of more modern field methods, the use of durable iron post monuments, extensive resurveys under the act of Congress approved March 3, 1909 (35 Stat., 845), and the notable change from the contract to the direct system of surveys by salaried surveyors provided for by the act of Congress approved June 25, 1910 (36 Stat., 740), which gave the immediate administrative control of the entire surveying work to this office. The revision of the Manual is imperative and has been delayed much longer than had been hoped for, due entirely to pressure of current work, but the present arrangement and progress in the revision assures the completion of this important work in ample time for service at the beginning of the next field season.

TERRITORY OF ALASKA.

COAL LAND SURVEYS.

By act approved October 20, 1914 (38 Stat., 741), entitled "An act to provide for the leasing of coal lands in the Territory of Alaska, and for other purposes," Congress appropriated $100,000 for the survey, under the rules and regulations governing the survey of public lands, of areas of the United States in the Territory of Alaska known to be valuable for their deposits of coal, and directed that preference be given first in favor of surveying those areas commonly known as the Bering River, Matanuska, and Nenana coal fields. Accordingly after careful consideration of its provisions plans of survey were formulated with a view to furthering in the most practical manner the primary purposes of the act. These plans contemplated the extension of the rectangular surveys under the three existing principal meridians and base lines in Alaska, the making of a comprehensive topographic map in conjunction with the rectangular surveys, and the completion of the surveys of all three fields in one season. Fifteen parties were organized for this work, six of which were assigned to the Matanuska, six to the Nenana, and three to the Bering River fields. One surveyor in each group of parties was designated chief of the field in which he was operating and disbursing agent for all parties under his charge. All three districts were placed under the direct supervision of the assistant supervisor of surveys for Alaska. Supervisor of Surveys Frank M. Johnson visited each

of the fields during the summer and gave the organization and commencement of the work his personal supervision.

The parties assigned to the Matanuska field left Seattle May 5, 1915, with camp and surveying equipment and 30 pack horses. A base was established at Knik, Alaska, and the public-land surveys which had been executed in 1914 under the Seward base and meridian westerly of the lower Matanuska coal fields are being extended northeasterly to embrace the areas designated by the Geological Survey as coal lands.

The Bering River parties left Seattle May 15 with complete outfits and 10 pack horses. A base was established at Katalla, and the Coast and Geodetic Survey triangulation along the shore of Controller Bay was extended to a point in the coal fields. The latitude and longitude of this point was computed and its position in the rectangular net with reference to the Copper River base and meridian determined. Supplies and iron corner posts are being transported by small boat from Katalla to a point on the Bering River, thence by pack train to the survey camps.

Five of the six parties assigned to the Nenana field left Seattle May 27 and proceeded by way of White Horse, Yukon Territory, where 30 pack horses were procured, down the Yukon, and up the Tanana River to a point near the mouth of the Nenana, where, with the cooperation of the Alaskan Engineering Commission, a base was established. Thence the parties proceeded by pack train to the coal fields to the south. In the meantime the chief of the sixth party, who had left Seattle early in May and had proceeded to Fairbanks by way of the trail from White Horse to Dawson before the ice was out of the upper river, thence by water, was extending the triangulation which had been tied to the rectangular net in 1910, to a point in the vicinity of the coal field which was reached by the time the five parties arrived on the ground. The latitude and longitude of this point was then computed and its position in the rectangular survey system with reference to the Fairbanks principal meridian and base line determined and the survey of the coal fields initiated therefrom.

A topographic map of each field is being made on a scale of 2 inches to the mile with the township as the unit, the public-land lines constituting the horizontal control and base for the topographic map. The vertical control in the Matanuska and Nenana fields is carried by vertical angles from the levels of the Alaskan Engineering Commission along the preliminary lines of the railroad surveys which traverse these fields, and in the Bering River district from bench marks of the United States Geological Survey. The contour interval adopted in all three fields is 50 feet.

Coal-mining engineers of the Bureau of Mines joined the Bering River and Matanuska survey camps during the latter part of July

and in cooperation with the General Land Office parties are engaged in forming leasing units of the newly created legal subdivisions.

On account of the fact that the Alaska field season prior to June 30 is very limited and because of the necessary preliminary work incident to the fixation of the initial points of the surveys, the actual acreage of coal-land surveys executed during the last weeks of the fiscal year is inconsiderable and is not indicative of the amount to be accomplished this field season. However, a conservative estimate of the actual number of acres surveyed up to June 30, 1915, is as follows: Bering River, 15,000 acres; Nenana, 19,000 acres; Matanuska, 60,000 acres. The field work in the Matanuska and Nenana fields will be completed this season, and the field work in the Bering field will probably be completed, though unusual fogs and cloudy weather in that section have interfered considerably with the making of the necessary observations, resulting in some absolutely unavoidable delays.

Considerable interest in the leasing plan is being manifested by prospective applicants for leases, especially in the Matanuska field where early and most favorable transportation facilities are assured. Although it is believed the coal in the Nenana field will be mined largely for local consumption, it is apparent that with the coming of the railroad there will be many applications for leases, and it would, therefore, appear desirable to designate leasing units in this field early next summer.

OTHER SURVEYS.

During the fiscal year, public-land surveys were extended over 90,000 acres of agricultural lands in the Cook Inlet district northeasterly of Knik. Also 22 Indian allotments were surveyed in southeastern Alaska. The survey of the town site of Wrangell was completed and the new town site of Anchorage, at one of the two tidewater terminals of the Government railroad, was laid out. Additions to the town site of Anchorage and to Seward, the other terminal of the railroad on Resurrection Bay, are now under survey.

SURVEY RECOMMENDATIONS.

No additional surveys under the Copper River base and meridian will be necessary in the near future. Personal inspection indicates conclusively that existing public-land surveys are sufficient to meet all reasonable requirements of settlement in that district for several years, nor is there any present demand for further expansion of the group of public-land surveys in the immediate vicinity of Fairbanks. It is, however, highly desirable that Land Office surveys precede the completion of the Government railroad in parts of the Susitna and

Tanana Valleys. The railroad will open an immense area to agricultural and mineral development. Several hundred settlers have already gone upon the surveyed lands in the Cook Inlet district, where soil and climatic conditions are especially favorable to agricultural and cattle-raising industries. It is reliably reported that similar climatic and soil conditions obtain in many parts of the valley of the Susitna and its tributaries. One of the principal factors, if not the chief factor, in the development of a new and practically little-known country is the public-land survey. Its very existence is an invitation and what it stands for an inspiration to the home seeker, the prospector, and others of the advance guard of development. The advantages to the Government and to the settler of the establishment of surveys on the ground prior to settlement are obvious. Existing surveys with those to be completed this fall embrace all desirable agricultural lands in the immediate Cook Inlet district. They should, however, be extended next season westward to the Susitna and up its valley along the line of location of the railroad.

While the Tanana Valley, on account of its remoteness at present from markets and the consequent greater cost of development, is not being settled upon to any large extent, it is unquestionably destined to become, with the advent of cheaper transportation facilities, one of the great grain-producing valleys of the country, and it would be highly desirable to extend next summer public-land surveys northerly from the Nenana coal fields along the line of location of the railroad to the Tanana River and thence along the river, expanding the surveys each subsequent season as settlement may warrant. It also seems probable that the General Land Office will be called upon next season to survey other town sites and reservations along the line of the Government railroad, and in addition the examination of isolated homestead surveys, and the execution of fragmentary surveys will be continued as the necessities dictate. In order to meet the requirements of survey along the lines herein indicated, provision should be made for the employment of nine field parties. The usual yearly allotment to Alaska from the appropriation for surveying the public lands is $25,000. On account of demands on this appropriation in the other surveying districts, it would appear probable that this allotment could be consistently increased next season. It is therefore recommended that Congress be asked for a special appropriation of $50,000 for the survey of public lands in Alaska, to be made continuously available until expended. After the exhaustion of the special appropriation, it is believed that the usual yearly allotment from the general appropriation will be sufficient to meet the requirements of survey in the future.

COAL-LEASING LAW.

A new method for the control and disposition of the coal deposits in the public lands of the Territory of Alaska was provided by the act of October 20, 1914 (supra), whereby lands containing coal may be leased for mining purposes, under the direction and supervision of the Secretary of the Interior.

The President of the United States is required to reserve not exceeding 5,120 acres of coal-bearing lands in the Bering River field, and 7,680 acres within the Matanuska field before opening said fields under the leasing act. The unreserved coal lands are thereafter to be divided by the Secretary of the Interior into leasing blocks or tracts of 40 acres each or multiples thereof, in such form as will permit the most economical mining of the coal, but in no case exceeding 2,560 acres in any one leasing block. The lands having been thus divided into leasing blocks, the Secretary, under the act, is then authorized, and not before, to offer such blocks or tracts for leasing, and award leases thereof through such plan as he may adopt, either by advertisement, competitive bidding, or otherwise.

The survey of the coal areas is therefore a necessary preliminary to the determination of the leasing blocks or tracts, and the act makes due provision therefor. The execution of the statutory direction in this particular is treated separately herein under the title "Coal-land surveys" (supra).

When the survey now in hand is completed and the coal areas have been divided into leasing blocks or tracts, which it is intended shall not be later than the opening of next season, timely notice will be given by the Secretary of the Interior, with due opportunity to all who may desire to submit applications for a coal-mining lease.

FREE PERMITS FOR COAL MINING.

The very liberal regulations adopted by the department December 30, 1914, carrying into effect the provisions of section 10 of the coal leasing act, which provides for the prospecting for mining and removal of coal, under permit, from small areas of the public lands in Alaska for strictly local and domestic uses without payment of royalty or rental have proved very satisfactory, and several permits have already been issued. Copies of these regulations have been widely distributed throughout Alaska through the local United States land offices at Juneau, Nome, and Fairbanks, and by furnishing several copies to every United States commissioner in Alaska, as well as to all persons making inquiries. In view of the pressing need for coal for local consumption, these regulations provide against irritating and damaging delays by allowing the applicant to begin his mining operations as soon as he has mailed his application for a permit, sub-

ject, of course, to the subsequent approval of his application. This provision has been found of extreme importance, particularly in rapidly developing sections of Alaska and in certain placer mining regions.

TIMBER RESERVE NO. 1.

The act of March 12, 1914 (38 Stat., 305), authorized the President to locate, construct, and operate railroads in the Territory of Alaska. Recently the Government purchased the property of the Alaska Central Railway Co., the successor of the Alaska Northern Railway Co., and is now engaged in extending the line to Fairbanks. A branch line is also being construcced into the Matanuska coal fields.

On June 22, 1915, an order was issued, reserving for the use of the United States, in connection with the construction and operation of the railroad, the timber upon the public lands north of the Chugach National Forest, extending 5 miles in width along the northern shores of the Knik Arm and Cook Inlet, between the mouth of the Knik River on the east and the mouth of the Susitna River on the west, thence north on each side of the Susitna River from its mouth on the south, to the mouth of the Yentna River on the north. The reserve also embraces the timber on an area 5 miles in width on each side of the right of way of the main line of the proposed railroad through the Susitna Valley to Broad Pass, and similar areas on each side of the right of way of the proposed branch line, extending into the Matanuska coal fields.

Subsequently the order was amended so as to include within the reservation the timber upon a strip of land 5 miles in width on each side of the proposed right of way of the main line of the railroad, beginning at Broad Pass, and extending down to the Nenana River and up Goldstream Creek to Fairbanks.

The purpose of the reservation is to prevent the timber needed for the construction of the railroad and its branches from falling into the possession of individuals or corporations, in which event it would be necessary for the Government to purchase timber which it once owned. It is not the intention of the Government, however, to make any unnecessary restrictions which will tend to retard the development of the Territory of Alaska along the lines of the railroad or its branches, and in the withdrawal order the interests of the public were conserved in every way possible. Only the timber on the land, not the land itself, was reserved. The land is still subject to location, settlement, or entry under the public-land laws, and it is provided in the withdrawal order that the Secretary of the Interior may permit settlers and those engaged in business in the locality to obtain such timber as they require for their own uses, provided that the timber is not needed for the construction of the railroad. It is also

the purpose of the Government to withold the issuance of final certificates and patents to the land within the timber reserve until the Alaskan Engineering Commission shall have acquired such timber as may be needed by it. When it shall be determined that no more timber is needed within a locality, the lands within that locality will be eliminated from that reserve, and persons entitled to patents for the lands will receive them, together with the timber that is remaining thereon. Such eliminations will be made from time to time and with as much dispatch as the circumstances will warrant.

MAP COMPILING AND DRAFTING.

The 1915 edition of the United States map, containing a new inset map of the Panama Canal Zone, was issued one month in advance of the previous year. The copper plates for 1916 edition are now in the course of revision; that part of Mexico appearing on the map will be revised, and other new features will be added. It is planned also to advance the date of issue of this edition.

Maps of Mississippi, Louisiana, Indiana, and Alaska have been compiled or revised and will issue during the year.

The work of compiling and drawing special maps for this and other bureaus has consumed a considerable time of the draftsmen. The demand upon the division for this character of work seems to be increasing.

Maps, charts, and other features prepared and installed under the direction of the Chief of Drafting Division, for display in the General Land Office exhibit at the Panama-Pacific International Exposition at San Francisco, were awarded three gold medals.

A map showing the meridians and base lines and areas governed thereby was compiled, drawn, and reproduced, copies of which may be obtained from the Superintendent of Documents, Government Printing Office, at 15 cents per copy.

TRACT RECORDS.

Special efforts have been made to have the tract records show, without delay, any pending application or entry, of whatever nature, and also to have the preliminary examination of homestead and desert-land entries, and timber and stone filings, made promptly:

First. In order that no one having occasion to use the tract records may be misled as to the status of any tract.

Second. In order to suspend, with as little delay as possible, entries or filings that may have been erroneously allowed by the local officers, either on account of the land involved not being subject to entry or the entryman having exhausted his right, etc. Failure to discover and correct errors of this character at the earliest possible period may result in irreparable loss to the entryman.

After posting of such cases by one class of clerks a careful examination is made by another class of each entry and filing for possible defects in the preparation of the papers, such as errors in the description, omission of evidence of citizenship, seals, signatures, etc. The questions of the qualifications of the entryman are carefully considered, and the tract books are, at that time, examined for errors in posting, conflicts, withdrawals, reservations, etc.

SUPPLEMENTAL PATENTS.

The act of Congress approved April 14, 1914 (38 Stat., 335), provides for the issuance of supplemental patents in cases where patents have reserved to the United States the coal deposits in the land and such lands are subsequently classified as noncoal in character.

Pursuant to the provisions of this act and instructions issued thereunder, Circular No. 327, dated June 3, 1914, there were withdrawn from the files and taken up for examination and action 1,874 cases, on which 1,227 supplemental patents have been issued.

It is estimated that there are about 2,500 of these cases still to be examined.

HOMESTEAD—TIMBER AND STONE—ISOLATED TRACTS.

A review of the work during the past year in the division of public lands, handling homesteads, timber and stone entries, and the public sale of isolated tracts, shows the approval for patent of 41,291 homestead entries, 794 timber and stone entries, 2,830 sales of isolated tracts, and 919 miscellaneous cash sales.

During the same period action was taken on 2,943 applications for second entry, as against 777 of the previous year; 5,875 applications for the sale of isolated tracts, against 5,900 of the previous year; 3,467 applications for amendment of entry, against 2,568 of the year previous; 1,118 applications for extension of time; 1,159 applications for leave of absence, against 1,258 of the year previous; 20,731 original homestead entries, against 14,264 of the year previous; 1,432 appeals from district land offices, as against 1,869 of the previous year.

An item worthy of note in this class of work is the evident appreciation of settlers in the semiarid districts of the preferred right of entry, under the enlarged homestead act, accorded to applicants for undesignated lands, by the amendatory act of March 4, 1915 (38 Stat., 1162), 2,591 applications for action thereunder having been filed prior to June 30, 1915; while up to the 1st of September 6,621 applications have been received and filed.

SUGGESTIONS TO HOMESTEADERS.

From time to time there is prepared in the General Land Office, for free distribution, a compilation of the several homestead acts, under the title "Suggestions to Homesteaders," with all the later statutes amendatory thereof, together with appropriate reguiations and instructions issued thereunder with the approval of the department.

Revised editions of this publication are issued at such times as seem requisite to keep homeseekers on the public lands advised as to new legislation, as well as any new decisions of the courts or the department affecting the rights of settlers on the public domain.

The homestead law is preeminently the best adapted among all our public-land laws to secure the development of homes and social communities, that form the basis of our national stability, and the general recognition of this proposition is attested by the fact that last year the office distributed, in response to requests for information, an edition of 150,000 copies of Suggestions to Homesteaders.

This year a new edition was issued the 1st of June, containing, as additional matter, the several amendatory provisions of the homestead laws made by the Sixty-third Congress, as well as recent instructions and information necessary for the use of the intending claimant under any of the existing homestead laws.

RECLAMATION HOMESTEADS.

Under the provisions of the reclamation act of June 17, 1902 (32 Stat., 388), 28 principal irrigation projects are being constructed by the Reclamation Service. In addition to these principal projects, a number of smaller projects are under consideration or in the course of investigation. Of the major projects, water for the irrigation of lands is available upon 23. Upon the Uncompahgre Valley project in Colorado, the Boise project in Idaho and Oregon, the Salt River project in Arizona, and several other projects, water is furnished upon a rental basis. Farm units, embracing areas reasonably required for the support of one family, have been established in 19 of the projects.

By the provisions of the reclamation extension act of August 13, 1914 (38 Stat., 686), the number of installments in which the construction charges in connection with irrigation projects must be paid was extended from 10 to 20, and the period of time within which such payments must be made was likewise increased from 10 to 20 years. This act further amended previous legislation by permitting the entry of land withdrawn for irrigation purposes where farm units have been established, but no public notice issued fixing the water-right charges and announcing the availability of water for irriga-

tion of the land, upon the announcement by the Secretary of the Interior of the fact that water is ready to be delivered to the lands in such farm units or some part thereof.

In addition to the projects being constructed under the provisions of the act of June 17, 1902, supra, several other projects upon Indian reservations are being constructed under the provisions of acts applicable to such projects alone. Among these projects the principal one is the Flathead project in Montana. Upon the Flathead project farm units have been established, though water is available at present for the irrigation of only a small part of the lands. To this project the provisions of the act of August 9, 1912 (37 Stat., 265), were extended by the act of July 17, 1914 (38 Stat., 510). Under the provisions of this act, upon the submission of proof of reclamation of the land and of the payment of all the charges, including the water-right charges due in connection therewith to the date of the submission of such proof, the entrymen are entitled to the issuance of a patent, reserving to the Government a prior lien to secure the payment of the water-right charges to become due thereafter. The act above mentioned also extends to the Flathead project the provisions of the act of June 23, 1910 (36 Stat., 592), authorizing the assignment of homestead entries within reclamation projects, upon the submission of satisfactory proof of compliance with the ordinary requirements of the homestead law with respect to residence, cultivation, and improvement of the land.

OPENING OF CEDED CHIPPEWA LANDS, MINNESOTA.

There has been no opening to homestead settlement and entry of lands classified as agricultural in the ceded Chippewa reservations, Minnesota, since the year 1911. These lands were withdrawn from opening under instructions from the department, to allow of changes of Indian allotments. With respect to lands in the Bois Fort Reservation, this action was taken in 1909 to permit Indians who had received unsuitable or worthless allotments, to select other lands in lieu thereof. In 1912 this office was instructed to withhold from opening lands in the Leech Lake, Chippewa of the Mississippi, and other Chippewa reservations, pending changes in Indian allotments, made necessary by the fact that an investigation in the field of the lands in certain reservations, ordered in June, 1908, by the then Secretary of the Interior, showed that a number of the tracts allotted to Indians were swampy in character, and were granted to the State by the swamp-land acts. The changes of allotments have nearly all been made and the lands in the different reservations, excepting certain tracts reserved for future allotments, and excepting lands in the Fond du Lac Reservation, have been released from withdrawal during the past year.

These agricultural lands are opened under section 6 of the act of January 14, 1889 (25 Stat., 642), and most of the lands thus classified under the act of 1889, and the amendments thereof, were opened to entry prior to the year 1911. The act of June 27, 1902 (32 Stat., 400), provides for the opening to homestead entry of the "cut-over" pine lands on the ceded Chippewa reservations. Most of the lands yet to be opened are of this character. There are, however, a large number of tracts classified as "pine" lands under the act of 1889, which tracts contain too little pine to attract millmen, and the pine on these lands is unsold, though offered for sale two or three times. The act of June 25, 1910, section 27 (36 Stat., 862), authorizes the opening of these "pine" lands to homestead entry, the entryman paying for the timber an appraised price at the time of making entry.

The next opening will take place as soon as practicable, and will include about 50,000 acres of "cut-over" lands and about 4,850 acres of "pine" lands.

RESTORATION OF RESERVOIR LANDS, MINNESOTA.

By act of August 6, 1914 (38 Stat., 683), Congress provided for the restoration to the public domain for entry under the homestead laws, subject to the right of the United States to overflow the same, any and all lands in the counties of Aitkin, St. Louis, Crow Wing, Cass, Itasca, and Beltrami, Minn., outside of the boundaries of the Minnesota National Forest, heretofore withdrawn by Executive order in connection with the improvements of the headwaters of the Mississippi River and its tributaries, the restoration of which has been or may hereafter be recommended by the Secretary of War, and under said act there were restored to entry on December 1, 1914, 5,327.90 acres of lands located in the counties mentioned, which lands found ready applicants.

MINNESOTA DRAINAGE ENTRIES.

The act of May 20, 1908 (35 Stat., 169), known as the Volstead Act, extends the drainage laws of the State of Minnesota to the lands of the United States in said State. The act authorizes a sale of the lands by the State to enforce the payment of the drainage charges. A purchaser is required to have the qualifications of a homestead entryman, but residence on the land and cultivation thereof are not prerequisites to obtaining title from the United States. Consequently the law is popular, and there has been active demand for the lands offered. Several entries have been made by persons living in States adjoining Minnesota. Before the act was passed the area of unappropriated surveyed land in the State of Minnesota was reported at

about 1,750,000 acres. On the 1st of July, 1915, the acreage reported was 943,831. The prospect of the early drainage of many of these lands has stimulated their disposition. During the past year there were approved for patenting 517 entries made under the Volstead Act, as against 245 approved in the preceding year, and there are still pending 373 entries.

Much trouble has been found in administering the law, because of its involved provisions, and there has been great diversity of opinion in construing its terms. Because of competition in bidding at the sales some of the lands were sold for a bonus, and the disposition of the excess has been a perplexing question. The State authorities contended that the excess should go into the State treasury, and the purchaser given credit for the amount on his future payments. It was finally determined by the department that this excess or bonus belonged to the United States. Most of the lands involved are ceded Chippewa lands, and the moneys are therefore held in trust for the Chippewa Indians.

There are about 225 entries for lands assessed for the construction of roads in connection with drainage ditches, the lands being sold for nonpayment of the tax assessed against the "towns" for such improvements. The proceedings appear to have been taken under the drainage laws, and these entries are being approved where the road and ditch tax are the same thing.

The law is so framed as to permit of speculation in the public lands, but this has been discouraged as much as possible in administering the law.

HOMESTEAD ENTRIES IN NATIONAL FORESTS.

During the past year notices were issued in accordance with the provisions of the act of June 11, 1906 (34 Stat., 233), of the restoration of 2,838 lists of lands in national forests, by which approximately 280,000 acres of agricultural lands were opened to settlement and entry under the homestead laws. In the previous year approximately 255,000 acres, enumerated in 2,580 lists, were opened. Up to June 30, 1914, approximately 1,685,000 acres have been restored to settlement and entry under said act of June 11, 1906. There are 352 lists of lands in national forests pending for action. During the past year 3,330 homestead entries were made of lands in national forests.

LIEU SELECTIONS FOR LANDS IN INDIAN RESERVATIONS.

In the annual report for 1914 will be found a statement with respect to the suspension of action under the act of April 21, 1904 (33 Stat., 211), which provides for exchange of ownership between the United

States and a private owner of land embraced within an Indian reservation.

During the past year the status of selections under said act has been given diligent attention, both by the General Land Office and the department, with the result that it is now believed the department will be in a position to settle the entire controversy within a short period.

FOREST LIEU SELECTIONS.

The act of June 4, 1897 (30 Stat., 36), which provided for the selection of public lands in lieu of lands in national forests, was repealed by the act of March 3, 1905 (35 Stat., 1264), except as to certain contracts previously entered into, involving land in the San Francisco Mountains and Grand Canyon National Forests, Ariz., and the Santa Barbara National Forest, Cal. The area of land in the San Francisco Mountains National Forest involved in a contract at the date of its execution was 975,000 acres, of which there is yet remaining approximately 25,000 acres that can be offered as bases in accordance with the repealing act of March 3, 1905. The exchangeable lands in Grand Canyon and Santa Barbara Forests have now been practically exhausted.

Selections under the act of June 4, 1897, were allowed for both surveyed and unsurveyed land until October 1, 1900, since which date such selections are restricted to vacant, surveyed, nonmineral land subject to homestead entry, as provided in the amendatory act of June 6, 1900 (33 Stat., 614). There are still pending approximately 900 selections awaiting survey of the land selected.

All selections suspended because of the so-called Hyde-Benson frauds are being rapidly disposed of, either by cancellation or patenting. In the annual report of this office for 1908 will be found a very clear and comprehensive statement of the nature and extent of these fraudulent selections, from which may be understood the immense labor required on the part of the field service and of the office to properly ascertain the true facts in each case and protect the interests of the Government. The length of time required for this work is due to the fact that in most cases portions of the same base tract have been used in several selections, and as the same questions are presented in each case, it is necessary to consolidate or treat together such allied cases, to the end that a full knowledge of the entire transaction may be secured, as well as uniformity of action.

Again, it not infrequently occurs that one selection involves the consideration of several bases, and the determination of the validity of each, which can only be ascertained after a careful investigation in the field, followed by hearing in the district land office.

CHIPPEWA INDIAN TIMBER LOGGING, MINNESOTA.

The twelfth year of logging on ceded Chippewa lands, Minnesota, closed on June 30, last, and during said year there were cut and removed 46,272,950 feet of timber, valued at $373,442.73, as against 85,799,120 feet of timber, valued at $763,915, in the previous year. The falling off was due to dullness in the lumber market, on which account several of the purchasers obtained extensions of time to complete their contracts. The total amount of timber cut during the 12 logging seasons is 1,224,564,667 feet, and the total price paid is $8,678,787.79, the average price being $7.06½ per 1,000 feet. Prior to the sales of the timber estimates are made by Government examiners, but the purchasers pay for the amount actually cut and removed, their bids being by the thousand feet. The amount cut thus far exceeds the Government estimates by 316,772,750 feet, and the moneys received exceeds by $2,164,661.66 the total prospective receipts, based upon the prices bid per thousand feet and the Government's estimates as to the amount of timber upon the land. There are 15 purchasers whose contracts are not completed. The average number of logs per thousand feet scaled is 11¾. The expense of conducting the logging operations for 12 years, including scaling, superintending, recording, office rent, and the examination of the Mille Lac Reservation, has been $360,879.35, which is 4$\frac{4}{25}$ per cent of the total receipts.

OKLAHOMA INDIAN LANDS.

There has been considerable inquiry in regard to the disposal of Indian lands in Oklahoma. These principally relate to lands belonging to the Five Civilized Tribes, over which this office has no jurisdiction. Nearly all of the lands in Oklahoma under the jurisdiction of this office have been entered, the reports showing that there are only 42,177 acres of unentered lands in said State. Under the act of June 30, 1913 (38 Stat., 92), the unentered lands in the Kiowa, Comanche, Apache, and Wichita Reservations are subject to sale for the benefit of the Kiowa Agency hospital fund. A sale of remnant lands, under said act, was held in December, 1913, at which all the vacant lands were sold. Since said sale a few entries have been canceled and the tracts covered by such entries are vacant and subject to sale under said act of June 30, 1913. In the year 1906 there were disposed of to homestead entrymen under sealed bids 480,000 acres of lands in pasture and wood reserves, situated in the Kiowa, Comanche, and Apache Reservations. The entrymen were all required to pay one-fifth down, the balance in yearly installments, and to comply with the homestead laws. Letters to this office indicate that the entrymen in a number of cases are not complying with the homestead law.

The act of August 1, 1914 (38 Stat., 582, 598), grants an extension of time within which to make the annual payments, and provides further with regard to these entries "that no forfeiture of entry shall be declared except for fraud"; consequently none of these entries are being canceled except upon relinquishment or for fraud, even though the entryman may not be complying with the law. There are a few of these tracts which are vacant and they are subject to sale under said act of June 30, 1913. It is probable there will be another sale under said act next year.

ABANDONED MILITARY RESERVATIONS.

The act of February 11, 1915 (38 Stat., 807), provided for the disposition of lands in the abandoned Fort Assinniboine Military Reservation, Mont. This reservation comprises about 170,000 acres and is one of the largest of the remaining military reservations. In accordance with departmental instructions, the field work in connection with the survey and classification of the lands has been completed this summer, but the office work of preparing the field notes, plats, and reports will not be finished for some time, so that it is impracticable to have an opening before next spring. The State of Montana has made selection of 2,000 acres of land, including buildings, in accordance with the terms of the act. The law provides for the opening to settlement and entry under the homestead laws of the agricultural lands, the entrymen to pay $1.25 per acre for the land, except for lands entered during the first six months, in which case the price is $2.50 per acre. The manner of opening is to be prescribed by proclamation of the President. The timberland is to be sold under special regulations, and the mineral lands are subject to entry under the mining laws.

By Executive order of August 10, 1911, lands in the abandoned Fort Grant Military Reservation, Ariz., except the portion included in the Crook National Forest, were turned over to this department for disposal under the act of July 5, 1884 (23 Stat., 103). The plats of survey of the lands turned over to this department, aggregating about 13,000 acres, have recently been approved. Nearly 4,000 acres are included in grants to the State of Arizona, and the remaining lands are to be appraised prior to their public offering under the act of 1884. The appraisement will be made soon, and the sale will take place as soon as practicable.

Lands in the abandoned Fort Brown and Fort Ringgold Military Reservations, Tex., have been duly surveyed and appraised, but the sale of the property has been deferred owing to the temporary use of a portion of the property for military purposes.

TOWN-SITE AND KINDRED ENTRIES.

The prosperity of a nation is measured largely by the growth of its cities and towns. The establishment of marts of business, trade, and manufacture on the public domain keeps pace with the settlements for agriculture and other pursuits, and in some cases precedes such settlements.

Laws have been enacted by Congress for town-site and kindred purposes as follows:

Section 2286, United States Revised Statutes, for county seats.

Section 2380 authorizes the President to reserve town-sites to be disposed of under section 2381.

Sections 2382 to 2386 provide one method and section 2387 and 2394 provide another for town-site entries.

Additional town-site entries may be made under act of March 3, 1877 (19 Stat., 392).

Section 11, act of March 3, 1891 (26 Stat., 1101), authorizes entry of land in Alaska by a trustee for the town-site occupants thereof, and section 16 of that act allows the creation of town sites on mineral lands.

The acts of April 16 and June 27, 1906 (34 Stat., 116 and 519), as amended by act of June 11, 1910 (36 Stat., 465), provide for town sites in reclamation projects.

The act of March 12, 1914 (38 Stat., 305), makes provision for town sites along the Government railroad in Alaska Territory.

Mission sites in said Territory are entered under section 27 of the act of June 6, 1900 (31 Stat., 330).

Town sites on Indian reservations are entered in each case under special acts applicable to the opening of each reservation, and water-supply sites are also under special acts in each case; parks and cemeteries for incorporated cities and towns may be entered under act of September 30, 1890 (26 Stat., 502), and cemeteries for religious, fraternal, and private corporations or associations can be entered under act of March 1, 1907 (34 Stat., 1052); title to trade and manufacturing sites in Alaska is acquired under section 10 of the act of May 14, 1898 (30 Stat., 409).

Lots in the town sites of Poplar, Wolf Point, Brockton, Sprole, Blair, Milk River, Frazier, Oswego, and Macon, Mont., were offered for sale at public auction during the months of June and July, 1914. More than 1,000 lots were sold and the amounts received therefrom were in excess of $80,000.

Lots in the town site of Big Arm, on Flathead Lake, Mont., were sold during August, 1914, and all lots and farm tracts at Siletz, Oreg., were sold during November, 1914.

Lots in the town sites of Parshall and Van Hook, N. Dak., were also offered for sale in November, 1914. Records were established in these towns in the amounts received for lots in excess of their appraised values. One lot at Parshall appraised at $25 sold for $1,000, and a lot at Van Hook appraised at $60 sold for $2,500.

Additional sales were made of the town lots at Camas, Mont., in July, and at Worley, Idaho, in November, 1914.

In May, 1915, the forfeited and unentered lots in the town sites of Timber Lake and Dupree, S. Dak., were offered for sale and the inequalities of former sales adjusted.

The town site of Solano, N. Mex., has been surveyed and will be offered for sale during the fall of 1915, under section 2381, United States Revised Statutes.

Along the line of the Government railroad in Alaska 23 tracts of land have been reserved for town sites. One of them, Anchorage, has been surveyed and the superintendent of sale reports that 655 lots therein were offered in July, 1915, at public sale and were purchased for the sum of $148,980. The land was a barren Alaskan plain and in scarcely a month it contained 2,500 population, and by reason of the continued increase another sale was held the middle of August, at which 183 lots were sold for $23,000.

During the past year there have been approved 8 town-site applications made by trustees, and 2 have been rejected; 3 applications for town-park sites have been approved, and 1 rejected; 2 town cemetery sites have been approved; 1 orphanage site application has been approved; 3 applications for Alaska trade and manufacturing sites were received and 2 approved; and town-lot applications covering 574 lots in 55 town sites, not including the 17 town sites in Indian reservations, mentioned above, were received, of which number 330 were approved and 173 rejected, the remainder pending.

FLATHEAD INDIAN LANDS.

The Flathead Indian Reservation, situated in the State of Montana, was originally opened to homestead entry in the year 1910, under the act of April 23, 1904 (33 Stat., 302). These lands were considered superior in quality, and there has been great demand for all tracts suitable for farming purposes. By reason of changes of Indian allotments, and other reasons, there were a number of unappraised tracts which were not opened in the year 1910. These were appraised in the year 1913, at prices which were regarded as representing values in 1913, after the surrounding lands had been settled up for three years. The settlers, several of whom went on the land in 1910 and 1911, have objected to paying these prices, and have insisted that the lands should be appraised in accordance with the prices in the original appraisement, made in 1909.

In the last Congress legislation was attempted for their relief, but failed of passage, and action on the applications of these settlers is deferred pursuant to departmental direction, to afford them an opportunity to secure legislation in the ensuing Congress.

A number of settlers located on Flathead lands, classified as timber lands, and there have been numerous homestead applications for these timber lands. These applications have all been rejected for the reason that these lands are not subject to homestead entry until after all the timber has been cut and removed. The act of March 3, 1909 (35 Stat., 781, 796), provides for the sale of the timber on these lands, and that after the sale and removal of the timber such of the lands as are valuable for agricultural purposes shall be sold and disposed of under regulations to be prescribed by the Secretary of the Interior. On August 4, 1915, regulations covering the subject were approved by the department. It was provided therein that after the timber has been sold and removed the lands are to be reexamined and the agricultural and grazing lands will be appraised and opened to entry under the homestead laws, the appraised price to be paid as provided in said act of April 23, 1904. No rights are gained by settlement or application until these lands are opened in accordance with the regulations. This office has not been advised by the Indian Office, which office has charge of the sale of this timber, that the timber has been sold and removed from any specific tracts.

Section 13 of said act of April 23, 1904, provides for the sale of lands classified as agricultural lands of the first and second classes and grazing lands undisposed of at the expiration of five years from the taking effect of the act, and pursuant thereto notices issued of the offering on August 16, 1915, of 15,963 acres in the Kalispell district, and on August 23, 1915, of 62,153 acres in the Missoula district.

Certain of the lands in the Flathead Reservation were classified as barren, burned over, or as containing small timber by the original Flathead appraisement commission. The act of April 23, 1904, made no provision for the disposal of these lands, but their disposal at not less than the appraised price was authorized by section 29 of the act of Congress approved June 25, 1910 (36 Stat., 863). Under authority of said act regulations were issued on July 3, 1915, for the offering for sale of the lands thus classified; the lands in the Kalispell district, aggregating 5,710 acres, to be offered on August 18, 1915, and the lands in the Missoula district, aggregating 40,925 acres, to be offered on August 25, 1915.

RESTORATION OF CROW INDIAN LANDS.

Approximately 185,000 acres within the former Crow Indian Reservation, Mont., withheld from settlement since 1910, were restored to homestead entry in 320-acre tracts in October, 1914.

OPENING OF STANDING ROCK INDIAN RESERVATION.

The diminished Standing Rock Indian Reservation, in North and South Dakota, embracing approximately 1,200,000 acres, was restored to homestead entry in May, 1915. Prior to the opening the area avail-

able for homesteads was diminished by allotments to Indians and selections of school lands by the States, to the extent that less than 100,000 acres were available.

SALE OF LEMHI AGENCY, IDAHO.

Instructions have been issued for the public sale at Lemhi, Idaho, on September 13, 1915, under the act of Congress approved July 19, 1912 (37 Stat., 195), of the Lemhi Agency and school plant and farm. This property consists of 434 acres of land, which have been appraised at prices ranging from $10 to $35 per acre, the total appraisement being $10,400, and 23 buildings appraised at $4,260.

INDIAN ALLOTMENTS.

The wisdom of a regulation adopted in September, 1913, and referred to in my report of last year, to the effect that no application for allotment on the public domain made under the provisions of the act of February 8, 1887 (24 Stat., 388), as amended, be accepted unless accompanied by a certificate of the Commissioner of Indian Affairs showing that the applicant is an Indian entitled to an allotment of public lands, is made further apparent from the fact that during the past fiscal year nearly 600 applications made by persons not entitled to take public lands by allotment were finally rejected and some 95,000 acres of land thus rendered subject to disposal under the settlement and other applicable land laws.

During the past year 2,324 trust patents, embracing 284,713.33 acres of land, were issued to Indians. During the same period 1,699 patents, conveying title in fee, were issued to Indians found competent to assume charge of their own affairs and to purchasers of allotted lands. The issuance of these fee patents operated to relieve 202,050.06 acres of land from restriction against alienation and rendered that amount of land subject to taxation.

FLATHEAD VILLA SITES, MONTANA.

The act of April 12, 1910 (36 Stat., 296), provided for the survey and sale as villa sites of lands around Flathead Lake, in the former Flathead Indian Reservation. These lands are situated along the south half of the lake. The lands adjoining the north half of the lake were disposed of many years ago, and numerous homes and fruit orchards have been established thereon. Flathead Lake has an area of approximately 360 square miles, and several steamboats ply between the various towns upon its borders.

Under regulations approved March 20, 1915, tracts set aside as villa sites under the provisions of the act of April 12, 1910, supra, within the former Flathead Indian Reservation, Mont., were offered

for sale at public auction, beginning at Polson, Mont., on July 26, 1915. The sale was adjourned to Dayton, Mont., on August 6 and concluded at Kalispell, Mont., on August 7, 1915.

There were 889 parcels of land, not less than 2 nor more than 5 acres in area, fronting on Flathead Lake, and under the regulations could be sold for the minimum of $10 per acre. All the lands, however, brought far in excess of that amount, except about 65 acres, sold for the benefit of the Grand Army of the Republic at the minimum price.

Purchases were made by residents of many of the States and by civic and in behalf of patriotic organizations. Not one of the tracts remains unsold.

The land, having a minimum valuation of less than $35,000, sold for approximately $125,000, some tracts bringing about $300 per acre.

As population increases the demand for villa sites, summer homes, hotels, sanitariums, and health, recreation, or pleasure resorts will become more and more urgent, and a general law should be enacted authorizing the entry of public lands for such purposes, by an amendment of sections 2380 and 2381, United States Revised Statutes, as recommended in report on Senate bill 1214, Sixty-third Congress. There are numerous islands reserved by the Government for lighthouse and other purposes in the Great Lakes, and in the rivers and lands along the shore lines of the country, which from time to time are being released from reservation or are being brought into market, many of which would make ideal places for said purposes.

RAILROAD GRANTS—RIGHTS OF WAY.

A review of the year's business in the adjustment of railroad grants, the adjudication of "Carey Act" propositions, and right-of-way applications is, upon the whole, very satisfactory.

During the past year there were finally adjudicated and closed 5,065 cases of all kinds, as against 4,245 cases of a similar character during the previous year.

In the present year the total area disposed of was 4,403.606.05 acres, as against 1,189,897.27 acres in 1914.

The total area certified and patented under railroad and wagon road grants was 1,624,142.27 acres.

Early in the year a new system was inaugurated, whereby all cases taken up for examination and adjudication were required to be finally disposed of without reference to the amount of work entailed, and all railroad lists were required to be closed out as a whole; that is to say, when a railroad list is taken up for action the entire list is then disposed of, without passing the more difficult questions for future adjudication.

It is undoubtedly true that this system has militated against a larger showing than has been made, but at the same time there is no questioning the fact that the office has profited, in that many old cases which have been passed over in the past because they were difficult have been finally taken up and disposed of.

One instance of this old work taken up and disposed of stands out prominently.

On November 13, 1895 (21 L. D., 412), the department held that the grant of the Northern Pacific Railroad (now Railway) Co. did not extend east of Duluth, Minn., and consequently the company had no grant of lands coterminous with its line of road between Superior and Ashland, Wis. At that time the company had pending before this office a large number of indemnity selections of lands in what is now the State of North Dakota, in which losses in Wisconsin had been designated as bases. The department required the company to substitute new specifications of losses for the Wisconsin bases. Under protest and with a reservation of all its rights under its original selections, the company filed new specifications of losses, among which were a large quantity of lands in the Crow Indian Reservation, Mont. Thereafter the lands selected went to patent. On April 16, 1900 (177 U. S., 421; ibid 435), the Supreme Court of the United States held that the company's grant extended east to Ashland, Wis., as contended by it. On January 27, 1902, the company requested that the Wisconsin bases referred to above be reinstated and the Montana bases be released. The reason for the request was that the Montana losses could be used as bases for indemnity selections in the second indemnity belt in that State where the grant was largely deficient, whereas the Wisconsin losses could not be used for that purpose. In his decision of April 12, 1902, the Secretary directed this office to grant the request in all cases where the Wisconsin bases have not been used as bases for other approved selections. Upon promulgating the Secretary's decision, the attorneys for the company suggested the postponement of the substitution of the bases, inasmuch as such change would interfere with the patenting of lands under the company's grant, which it was very anxious to have issued at as early dates as possible. In view of these suggestions and the fact that the substitution would necessitate a considerable amount of labor, and the force available at that time was not sufficient to make such rearrangement and handle the more important work pending, the substitution was postponed and remained undisposed of. During the fiscal year just ending this matter was taken up, and I have the honor to report that approximately 471,322.22 acres of the said Wisconsin bases have been reinstated in accordance with the Secretary's instructions, and a corresponding amount of the Montana bases released.

Prior to the installation of the serial system in 1908 cases involving contests between the railroad companies and other claimants, suits to set aside patents and other matters in controversy were entered upon a docket kept for that purpose, and filed under the docket number. During the past fiscal year the unclosed files of these docket cases were gone over, and where it was possible action was taken and the cases closed. In this way a large number of the cases were closed, and the number remaining has been reduced to a minimum.

RAILROAD RIGHTS OF WAY.

Not the least important of the work transacted hereunder in the past year has been to clear the records of old, approved railroad rights of way where the roads have not been constructed and requiring proof of construction in other cases.

During the year 714 railroad right of way grants, under the act of March 3, 1875 (18 Stat., 482), have been investigated; of these, 302 were declared to have been forfeited under the several forfeiture acts; and in the remainder of the cases (412) the grantees were called upon to show cause why the grants should not be declared forfeited for failure to file evidence of construction. In response to this call, proof of construction has been filed in 86, leaving the remainder still pending.

In this line of work the following States have been fully covered: Washington, Oregon, California, Idaho, Nevada, Arizona, New Mexico, Montana, and Wyoming.

RIGHTS OF WAY FOR IRRIGATION AND OTHER PURPOSES.

A decided increase in the activities under applications for rights of way other than railroad purposes is apparent during the past year, there having been received in all 1,112 applications, as against 666 for the year previous.

As against 898 last year, 1,389 cases were disposed of this year.

POWER SITE RESERVES, ETC.

Pursuant to the provisions of the act of June 25, 1910 (36 Stat., 847), as amended by the act of August 24, 1912 (37 Stat., 497), and section 13 of the act of June 25, 1910 (36 Stat., 855), 56 withdrawals were made, as against 104 last year, a decrease of 48, withdrawing 292,134 acres, as against 247,139 acres last year, an increase of 54,495 acres; 55,646 acres theretofore withdrawn were restored, as against 90,305 acres during the previous year, a decrease of about 40 per cent. The restorations were made by 37 orders, as against 53 orders the previous year, a decrease of 16.

It may be stated that on June 30, 1915, there were outstanding 2,228,105 acres withdrawn for power sites and 182,653 acres withdrawn for public water reserves.

STATE DESERT LAND SEGREGATION.

Final action on State segregation lists, under the act of August 18, 1894 (Carey Act), shows a marked increase.

During the present year applications for withdrawal under the act of March 15, 1910, covering 1,048,654.81 acres, were finally disposed of, as against 315,209 acres during the year 1914.

Segregation lists to the amount of 108,464 acres were disposed of during the same time, as against 15,069 acres the year previous.

The receipts under the "Carey Act," by way of segregation lists, this year were 98,664.85 acres, and the amount finally disposed of 108,664.97 acres.

Patents were issued under "Carey Act" projects during the past year for 146,079 acres, as against 4,244.05 acres the year previous.

The work and reports of the "Carey Act" inspectors of this office are more and more being recognized as criterions as to the sufficiency of water, water duty, and matters relative to the physical features of various projects. Suggestions have been made during the past year by members of Congress that certain of such reports be released by tke Land Office, for the purpose of incorporating them into executive documents for general distribution.

In this connection it may be said that the State of Oregon, in its pioneer effort to rehabilitate "Carey Act" projects, otherwise likely to fail, has met with a measure of success which should be an object lesson worthy of emulation by the balance of the arid West. The $450,000 which was appropriated by the State for the completion of the Tumalo project (Oregon Carey Act list 13) seems to have been well expended, and from present indication appears to have placed the project upon the high road to ultimate success.

DESERT-LAND ENTRIES.

It is axiomatic that the desert-land law contemplates the reclamation of arid and semiarid land by the application of water, and that land for which there is no available water supply should not be held subject to desert-land entry.

The regulations in force for many years permitted the allowance of desert-land entries for lands for which there was no available water supply. Relative to proposed reclamation, applicants merely alleged that they intended to reclaim the tract sought by conducting water thereon, indicated the proposed or expected source of their water supply, and furnished a map or plan intended to show the mode or

contemplated irrigation. The result was (*a*) the segregation of large areas of desert land incapable of reclamation by irrigation, under a statute and form of entry, where accomplishment of that purpose was the primary consideration to acquiring patent; and (*b*) to induce many people of limited means to expend their time and money in the improvement of claims for which there could be no ultimate hope of procuring title under the desert-land acts. To remedy this evil radical changes in the desert-land regulations were made March 23, 1914, and on February 25, 1915, with the same end in view, it was determined to have all applications for desert-land entry reported upon by field agents of the office before finally deciding whether or not entries should be allowed. In addition and for the purpose of affording relief to those who had made desert-land entries for lands for which there is no adequate water supply, because of misunderstanding as to the scope and intent of the law, or misinformation as to available water, the Land Department recommended and Congress passed the act of March 4, 1915 (38 Stat., 1138–1161). As indicating to some extent the need of the legislation and changes in procedure above mentioned, it may be stated that during the past two years upward of 5,000 applications for extension of time within which to submit final proof have been considered, claimants being unable to secure water for the irrigation of their lands within the period prescribed by law. This legislation was recommended for the purpose of affording an opportunity for equitable disposition of pending entries for which there is no adequate water supply, and it is intended by the amended regulations to obviate a recurrence of such a situation.

The maximum area for which entry may be made under the reclamation act of June 17, 1902 (32 Stat., 388), and supplemental legislation, is 160 acres. A like restriction of area is placed on desert-land entries for coal, phosphate, and certain other mineral lands (36 Stat., 583; 38 Stat., 509), with further restriction as to title (surface only). Irrigable lands should be disposed of in comparatively small tracts, certainly not more than 160 acres to one person. It is recommended that legislation be enacted limiting desert-land entries to 160 acres.

During the past fiscal year 2,711 desert-land entries were patented, embracing 448,752.08 acres of land, as compared with 2,127 entries, embracing 346,794.74 acres, during the previous year. Examination was made of 9,534 proofs of annual expenditures, and 2,990 applications for extension of time within which to submit proofs, and 361 assignments, were considered during the past year.

IRRIGATION PROJECTS.

On September 30, 1910, the department directed that irrigation projects alleged as sources of water supply in desert-land entries be investigated in the field, and that the reports be favorably acted

upon before proofs are accepted. Subsequent to the adoption of this practice approximately 600 reports have been submitted to this office by field agents on projects involving the reclamation of over 10,000,000 acres. Reports of this kind are based on actual investigations on the ground, consideration being given to all engineering features of the project involved. In the examination the officer makes a detailed study of the stream system, the adequacy and permanency of the water supply, matters relating to construction and maintenance costs, the financial ability of the organizers to construct and maintain, the feasibility of the main system, the methods for water distribution, the title of the water supply relied upon, the character of the lands to be irrigated, and the duty of the water proposed to be utilized.

During the past fiscal year, 253 reports have been disposed of by this office, favorable action having been taken on 167 projects, adverse action on 58, and 28 cases closed without definite action. In the consideration of these reports a careful analysis is made of the facts reported by the examiner, and in reaching a conclusion a decision is rendered which for the purposes of administration may be termed an adjudication or finding of the rights under the State laws of the project and those claiming thereunder to the waters in question. In rendering a decision, due regard is had to local conditions affecting the particular project, such as kind of crops produced, length of irrigation season, etc., and every effort is made to avoid working any undue hardship on bona fide projects or settlers.

This work, which is not only for the protection of the interests of the Government but also in the interests of public-land claimants, discourages the construction of projects without full information on the vital matters concerned, and tends to prevent the promotion of fraudulent enterprises.

STATE SELECTIONS.

Mention was made in my report of last year of the fact that the act of Congress approved February 28, 1891 (26 Stat., 796), was construed by the Land Department for a number of years as a general adjustment act, alike applicable to all States and Territories having unadjusted school grants, and also authorizing exchanges of lands in school sections within reservation boundaries for lands outside, as well as the selection of lands as indemnity for actual losses to the various school grants, and that, a contrary view having been expressed by some of the courts with respect to such exchange of ownership, the approval of selections based on the exchange provisions of said act had been withheld, with a view to further legislation or a decision in the court of last resort.

Under date December 3, 1914, the department directed the preparation and submission of a detailed report covering the various questions which have arisen in connection with the adjustment of pending school grants. Such report was made July 27, 1915. It contains a discussion of the school grants of 13 of the public-land States; State constitutional provisions; Federal and State legislation; decisions of Federal and State courts and of the department, as well as tabulated statements showing present status of adjustment. This report, it is understood, will be printed by the department, and will, it is believed, furnish the requisite information upon which proposed remedial legislation may be presented to Congress.

During the past fiscal year 16,277.38 acres of indemnity school land selections, and 840,606.36 acres of selections under grants in quantity for specific purposes received departmental approval and the lands so selected were certified to the States making the selections.

SWAMP AND OVERFLOWED LANDS.

The grant of swamp and overflowed lands made by the acts of Congress approved March 2, 1849 (9 Stat., 352), September 28, 1850 (9 Stat., 519), and March 12, 1860 (12 Stat., 3), now sections 2479, 2480, 2481, and 2490, United States Revised Statutes, is still in process of adjustment. Some old claims have not been finally adjudicated and new claims are being constantly presented.

Up to June 30, 1915, the acreage patented as swamp and overflowed lands to the several States which were the beneficiaries of the grant reached the following totals:

Area patented as swamp land.

	Acres.
Alabama	418,520.14
Arkansas	7,685,512.07
California	2,095,105.18
Florida	20,201,045.30
Illinois	1,457,359.20
Indiana	1,254,270.73
Iowa	873,816.42
Louisiana	9,357,928.14
Michigan	5,655,689.56
Minnesota	4,662,727.10
Mississippi	3,284,280.08
Missouri	3,346,024.51
Ohio	26,251.95
Oregon	262,590.34
Wisconsin	3,251,462.34
Total	63,832,583.06

In addition to this large area of public land, cash and land indemnity have been given to the same States under the provisions of the acts of March 2, 1855 (10 Stat., 634), and March 3, 1857 (11 Stat., 251), as follows:

Cash and indemnity grants to States.

	Cash.	Acres.
Alabama	$27,691.50	20,920.08
Arkansas	374,450.00	
Florida	67,221.69	94,702.85
Illinois	473,875.99	2,309.07
Indiana	39,080.14	4,880.20
Iowa	537,477.59	321,976.93
Louisiana	53,118.65	32,265.08
Michigan	15,922.06	24,088.69
Mississippi	46,449.62	56,781.76
Missouri	195,874.82	81,016.69
Ohio	29,027.76	
Wisconsin	185,278.97	106,047.99
Total	2,095,468.79	743,989.39

It thus appears that upward of 64,500,000 acres of land and $2,000,000 have been given to the States named to enable them, as stated in said act of September 28, 1850, "to construct the necessary levees and drains to reclaim the swamp and overflowed lands therein," it being provided further that the proceeds of the land granted, whether from sale or direct appropriation in kind, should be applied exclusively, as far as necessary, to the purpose of reclaiming them. Has this been done and the grant thus administered in the interest of the public?

An inquiry in this direction can arrive at one conclusion only—the grant has not been so employed by the States as to secure the drainage of the great body of lands granted, and in many cases the proceeds arising from the sales of the lands were used for other purposes. Not only has the intention of the grant been thus defeated, but it has in many cases been used to secure thousands of acres of high, dry lands of great agricultural or forest value. Doubtless none of the large land grants made by Congress has more completely failed of its purpose than the swamp grants.

Sixty-five years have elapsed since this grant was first made. It is, of course, increasingly difficult to determine the character of lands at the date of the grant which are now claimed as swamp. I believe that Congress should enact legislation declaring that, after a date fixed, preferably six months after the passage of the act, no new claims to swamp and overflowed lands be received or recognized by the Land Department, and I so recommend.

Patents for 19,219.63 acres of swamp and overflowed lands and 252.32 acres of swamp indemnity lands were issued during the past year, and claims aggregating 16,639.70 acres were rejected.

NATIONAL FORESTS.

Since the issuance of the last annual report 12 national forests have been reduced under the act of June 4, 1897 (30 Stat., 36), and 2 by the act of January 26, 1915 (38 Stat., 798–800), creating the Rocky Mountain National Park, in Colorado. The Pike National Forest, Colo., has been enlarged by the acts of August 24, 1914 (38 Stat., 705–706), and March 4, 1915 (38 Stat., 1194). Certain interforest transfers have been made involving three national forests, and the Zuni National Forest, Ariz. and N. Mex., has been consolidated with the Manzano National Forest. There are now 162 national forests, embracing 184,240,596 acres, of which area approximately 89 per cent is public land. The decrease in area of national forests since the beginning of the fiscal year is 1,080,606 acres.

During the fiscal year the public lands subject to disposition in 1,277,536 acres excluded from national forests in this and previous years have been restored to settlement and entry under the provisions of the act of September 30, 1913 (38 Stat., 113). Twenty-four thousand three hundred and twenty acres in New Mexico have been withdrawn pending determination as to the advisability of their inclusion in the Alamo National Forest. Areas temporarily withdrawn for forestry purposes but not needed therefor are released from withdrawal upon recommendation of the Secretary of Agriculture. Since the issuance of the last annual report 11,930 acres have been released from such withdrawal and the public lands therein subject to disposition opened to settlement and entry.

During the fiscal year 9 administrative stations, embracing 1,742 acres, and 1 right of way have been withdrawn by Executive orders under the act of June 25, 1910 (36 Stat., 847), for use by the Forest Service in the administration of the national forests, and 365 withdrawals for such purpose have been revoked, covering 62,251 acres. There are now 25 rights of way for wagon roads and 2,777 administrative sites withdrawn, embracing 352,689 acres—164 sites and 20,482 acres being near, and 2,613 sites, covering 332,207 acres, in the national forests.

NATIONAL MONUMENTS.

No new national monuments were created during the fiscal year under the provisions of the act approved June 8, 1906 (34 Stat., 225).

There are in all 31 national monument reservations located in the States and the Territory of Alaska—Arizona, 7; California, 6; Colorado, 2; Montana, 2; New Mexico, 5; Oregon, 1; South Dakota, 1; Utah, 3; Washington, 1; Wyoming, 2; Alaska, 1.

With few exceptions, these valuable reservations are still devoid of that administrative care and development necessary to their preser-

vation and usefulness to the public. Some of them, especially the great caverns, the pictured rocks, and the prehistoric ruins, continue to suffer from a vandalism that can not be prevented until moneys are available for effective warden service and restoration, road making, and other necessary activities now impossible.

Complaints continue to come to this office which we are powerless to relieve. I therefore very earnestly renew my recommendation of past years that Congress be urged to supply a small annual appropriation which will enable this bureau to employ, at practically nominal salaries, local custodians, and to make such minimum of repairs as will at least maintain the monuments in their present condition.

For a table showing location, date of creation, and area of the national monuments, see appendix, page 79.

BIRD RESERVATIONS.

During the fiscal year three new reservations for the protection of native birds were created. Two of these, Dungeness Spit and Ediz Hook, were created January 20, 1915. Each of these reservations consists of a long arm of land extending from the north shore of the State of Washington into the Straits of Juan de Fuca. Mille Lacs Reservation, consisting of a small island situated in Mille Lacs, a body of fresh water in Minnesota, was created May 14, 1915.

Dungeness Spit and Ediz Hook are not so much breeding grounds for native birds as asylums and refuges for vast numbers of water fowl, which rest there during heavy storms and during migrating seasons. At these times they have been persecuted mercilessly by market hunters.

The Mille Lacs Reservation is the breeding ground for many hundreds of gulls and terns, as well as the resting place for large numbers of edible water fowl during the migrating season.

During the year, also, two bird reservations were reduced as follows:

Deer Flat Reservation, Idaho, created February 25, 1909, was slightly reduced in area by Executive order of March 21, 1915, one 40-acre tract in private ownership being eliminated therefrom.

The Klamath Lake Reservation, created by Executive order of August 8, 1908, was reduced by Executive order of May 14, 1915, by the elimination therefrom of tracts of land both on the east and west sides of the reservation, which were occupied in part by squatters who had located in good faith many years prior to the creation of the reservation. It was found after a careful investigation upon the ground that the lands they occupied could be eliminated without serious injury to the reservation.

For a list of bird reserves showing location, date of creation, and area, where known, see appendix, page 80.

On July 17, 1914, a bird reservation was created out of Blackbeard Island on the coast of Georgia, but this order was vacated by the Executive order of May 25, 1915, which returned the island to the custody of the Treasury Department, with the express understanding, however, that whatever disposition might thereafter be made of it the wild life, consisting of both birds and animals should be fully protected. In furtherance of this protection the State of Georgia proposes to lease the island from the Government, or otherwise through possible legislation secure control over it for the purpose of creating a State game preserve, to be administered by the State of Georgia through its State game warden or other officer authorized by law for the purpose.

Inability on the part of the Agricultural Department to properly administer this island in the interest of bird protection, because of the lack of funds for the purpose, was the chief factor considered in connection with the restoration of this island to the jurisdiction of the Treasury Department.

CONTESTS.

The contest work is of a varied character and involves many intricate questions requiring special training and experience for the proper and intelligent handling of the same. The majority of the cases numerically arise under the homestead laws, the charges against the entryman being usually a failure to comply with one or all of the requirements of the law as to residence, cultivation, and improvements.

Desert-land cases are next in point of number; some involving only the question of the character of the land, but most of them also being based upon charges of noncompliance with law or insufficient water supply. The fact that desert-land entries are adjudicable by smallest legal subdivisions and may stand or fall in part according as part of the land is or is not reclaimed, makes many of these cases consume a great deal of time in their adjudication, in order to analyze the testimony and apply it understandingly to the various subdivisions of the particular entry.

Under the timber-and-stone laws there are presented questions of considerable difficulty in determining the character of the lands applied for, as well as the good or bad faith of the applicants.

Questions involving controversies between private claimants and States over lands alleged to be swamp in character have proved a prolific source of litigation the past year, and call for a special study and familiarity with the peculiar questions presented under the terms of the swamp-land grant. Cases are now beginning to come into the

office for adjudication from Alaska, and these cases bring up many new features peculiar to the situation in that Territory and the laws specially applicable thereto and involve a consideration of the history and policy of Alaskan legislation.

Besides controversies between private claimants, the field service of the office finds it necessary, in the performance of its duties, to institute proceedings on behalf of the Government against a considerable number of entries, and the same is true of the Forest Service in cases arising on lands subject to its supervision. Many of the Government contests involve extensive conspiracies for the acquisition of public lands, some of which, from the care necessary in thorough examination, are found to require more time than an equal number of ordinary cases.

The gradual reduction in the area of the public domain has not been accompanied with the diminution which might have been expected in the administrative work, at least in the number of contests. Not only is there no decrease in the number of contest cases received in this office on appeal from the decisions of the registers and receivers, but many of them are much harder fought than formerly. A mass of testimony is introduced on all phases of the questions involved, so that the average size of the records has doubled in the last few years. The records are replete with objections, extensive briefs are filed raising numerous and sometimes perplexing points of law, all of which require time for consideration.

During the past year 1,421 decisions were rendered by this office in this class of cases, and in this particular the work is practically current.

Not all contests that are filed result in hearings, as numerous entries are canceled in accordance with the rules of practice on account of the default of the entryman to serve and file answer to the charges of the contest, and likewise a large number of contests are dismissed for failure of the contestant to prosecute the same. During the past year 6,165 contests were disposed of in the above manner and the records thereby cleared by the cancellation of the entry or the dismissal of the contest, and the work in this class of cases is now current.

REPAYMENTS.

The existing laws governing repayments, section 2362, United States Revised Statutes, act of June 16, 1880 (21 Stat., 287), and the act of March 26, 1908 (35 Stat., 48), provide for the return of moneys covered into the Treasury of the United States, received in connection with the disposal of the public lands, to be repaid to the entryman, his heirs or assigns, or his legal representatives, in the absence of fraud on their part, in all cases where lands have been erroneously sold;

where money has been paid by innocent parties on fraudulent and void soldiers' and sailors' additional homestead entries; where entries were canceled for conflict; where entries are erroneously allowed and can not be confirmed; where applications to make entry, filing, selection, etc., are rejected; and where any amount has been paid in excess of the legal requirement.

Under said laws there were stated during the last fiscal year 1,689 accounts, allowing repayment of $305,310.83, and during said period there were denied 799 claims for repayment. This number of claims allowed and the amount repaid includes 42 accounts, allowing repayment of $147,825.14, being moneys received in connection with then pending claims for coal lands in Alaska and repaid in pursuance of section 3, act of October 20, 1914 (38 Stat., 741).

Repayment claims allowed and denied by years.

Year.	Claims allowed.	Amount.	Claims denied.
1911	2,338	$178,437.02	712
1912	2,097	178,952.15	619
1913	2,427	217,614.09	644
1914	1,775	123,139.11	482
1915	1,689	305,310.83	799

CORRESPONDENCE.

One of the burdens of the office that grows no lighter with the years, but gradually heavier, is the prompt and efficient handling of the general correspondence incidental to the administration of the public-land laws.

With the introduction of every bill in Congress proposing a new scheme for acquiring title to public lands and the passage of every new act in the same field, either original in its scope or amendatory of former legislation, the numerous inquiries for detailed information are alone a serious item in our general correspondence.

These letters of inquiry are, for the most part, of such a nature that careful attention to the response must be given, not only that the correspondents shall receive full information, but also that no mistakes are made that will later interfere with the proper administration of the law.

Without including formal responses, the record of this kind of correspondence, not relating to particular cases but general in character, shows the following for the last four years:

For the year ending June 30:

1912	49,366
1913	63,435
1914	68,379
1915	75,232

DISPOSITION OF APPLICATIONS, FILINGS, AND SELECTIONS WHEN LANDS ARE OPENED TO ENTRY.

It was found advisable during the latter part of the last fiscal year, in connection with the restoration of lands excluded from certain national forests in Oregon, to formulate general regulations to govern the disposition of applications, filings, and selections when lands are opened to entry upon survey or restoration from withdrawal or reservation, where not otherwise specifically provided. The regulations approved by you May 22, 1914, circular No. 324, secure equality of opportunity to applicants and uniformity in such openings and simplify administration.

Such regulations provide that all applications, filings, and selections for lands to be opened thereunder may be executed in the manner required by law and presented to the proper local land office in person, by mail, or otherwise within the period of 20 days prior to the date of filing the township plat or of restoration to entry, and that such applications, together with those presented by persons present at the land office at the hour when the lands become subject to entry, shall be treated as simultaneously filed. Where there are conflicting simultaneous applications and one of the applicants alleges prior settlement, his application will be allowed and the others rejected. If two or more such conflicting applications are received containing allegations of prior settlement, a hearing will be ordered to determine the priority of right, and where there are such conflicting applications in which settlement is not alleged the right to enter the land will be determined by a drawing.

The previous practice had been varied and unsettled. In certain openings special regulations were issued either by this office or the local officers. In many instances, where desirable lands were involved, intending applicants have stood in line outside the proper land office for days prior to the date of opening, in order to present their applications at the earliest possible moment on that date. There is now no occasion for such action, which was attended by many hardships to the applicants and difficulties of administration on the part of the land officials. Before the present impartial method was adopted the right to enter land when conflicting simultaneous applications without allegation of settlement were received was usually awarded to the highest bidder, a practice which gave an advantage to the man with money over his competitors.

During the fiscal year the openings conducted under the above defined regulations have been satisfactory to the public and this office.

STATE DEVELOPMENT—ADMINISTRATIVE POLICY.

The beneficent exercise by Congress of the duties, powers, and privileges incident to the Federal ownership of the public domain is in no instance more marked with the recognition of the great trust imposed for the national benefit than in the provisions that are made for the establishment and maintenance of our free institutions in new States on their admission to the Union.

In the preparation of a report on a bill introduced at the last session of Congress, proposing a cession to one of the States of all the public lands remaining therein, some very instructive and interesting figures were disclosed, illustrating the generosity with which Congress has dealt with the new States in this particular, both prior to and at the time of their admission.

Pursuing the inquiry along the line thus developed, grants to 15 States, taken as fairly illustrative of the Federal policy, have been tabulated, showing the amount granted to each State for all purposes:

Land grants to States.

States.	Acres.
Arizona	10,484,116.00
California	8,331,878.18
Colorado	4,432,169.00
Idaho	3,628,827.00
Montana	5,869,004.00
Nebraska	3,456,809.00
Nevada	2,723,647.00
New Mexico	12,409,014.86
North Dakota	3,163,084.00
Oklahoma	3,094,000.00
Oregon	4,355,324.00
South Dakota	3,433,153.00
Utah	7,408,018.00
Washington	3,042,906.00
Wyoming	4,137,076.00
Total	79,969,026.04

TERRITORIAL PROVISIONS.

The grants thus made are in each instance found in the enabling act, under authority of which the State was admitted to the Union; but prior thereto due provision had been made, while the future State was yet in Territorial form, for the support of common schools, by the reservation of sections 16 and 36 in each township, a reservation which ultimately became a part of the grant to the State.

In many instances similar care was exercised to provide a suitable foundation for the higher educational interests of the State by the reservation of 72 entire sections for the establishment of a State university.

The act of September 4, 1841 (5 Stat., 453), dealing generally with the admission of new States, provided for a grant of 500,000 acres of land for purposes of internal improvements to each State thereafter admitted to the Union. In lieu of this grant, however, Congress has, in some cases, made grants of quantity for specific purposes.

The intent of Congress to furnish the State with a fair equipment for the discharge of its obligations attendant upon statehood is apparent from the specific purposes of the several grants, not only in its generous provisions for the maintenance of the common schools and higher institutions of learning, but also for the erection of public buildings, establishment of State institutions, and for other purposes of internal improvement.

DONATIONS IN AID OF EDUCATION OR INTERNAL IMPROVEMENTS.

Under the several acts of admission and amendatory legislation provision is made for the payment to the State of 5 per cent of the proceeds of the sales of public lands within said State which shall be sold by the United States subsequent to the admission of the State into the Union, after deducting the expenses of such sale, for the creation of a permanent fund in aid of education or, in some cases, internal improvements. Under this provision the several States below have received up to June 30, 1914, the following:

Payments to States.

Arizona	$11,194.96
California	1,108,488.59
Colorado	477,249.80
Idaho	256,023.20
Montana	453,734.12
Nebraska	563,419.08
Nevada	35,631.19
New Mexico	130,400.56
North Dakota	535,234.54
Oklahoma	62,062.31
Oregon	731,924.83
South Dakota	329,778.25
Utah	96,217.31
Washington	404,940.27
Wyoming	228,922.09
Total	5,425,221.12

In addition to the foregoing, there is annually paid to each of these States, under the act of July 2, 1862, and the special amendatory act of March 4, 1907 (34 Stat., 1281), the sum of $50,000 for the complete endowment and maintenance of the agricultural college established in the State.

To further illustrate the general Federal policy in this direction, reference is made to the tabulated statement herein, page 70, "Land

and scrip granted to States and Territories for educational and other purposes"; also to "Swamp and overflowed lands," page 47.

RECENT LEGISLATION.

The generous care of the Federal Government in its provisions for the perpetuation of our free institutions in the new States extends equally to the individual citizen. By reference to the legislation secured during the Congress that has just expired the liberal policy of the present administration toward the home seeker upon our public domain is demonstrated in a marked degree. It is doubtful whether in a period of the same length of time so much was ever accomplished before to render available the resources of our public domain, and at the same time make the acquisition of title less burdensome to the settler.

Without regard to acts of Congress of local and purely remedial character, but taking those equally applicable throughout the public-land States, a few deserve more than a passing notice. Among these are:

(1) The act of April 14, 1914 (38 Stat., 336), making provision for the issuance of an unrestricted patent where theretofore patents have been issued to entrymen limited to surface rights only, and subsequently the lands so patented have been classified as noncoal in character.

(2) The act of July 17, 1914 (38 Stat., 509), entitled "An act to provide for agricultural entry of lands withdrawn, classified, or reported as containing phosphate, nitrate, potash, oil, gas, or asphaltic minerals." By this act the conservation of our valuable mineral resources is accomplished, and at the same time the surface of the lands within which such minerals are found is subject to appropriation for agricultural uses. The farmer and stock grower can make full use of the land included within his entry, or purchase, under a title that excludes the mineral deposits therefrom. In the absence of legislation of this character the known presence of mineral in public lands would exclude it from all appropriation except under the mining laws. By this act an exceedingly important step has been taken toward securing an effective conservation of our public domain without interfering with the present and profitable use thereof.

(3) One of the most important acts of the late Congress, and most far-reaching in its beneficent character is known as the extension act of August 13, 1914 (38 Stat., 686), by which the time for the payment under reclamation projects for the water rights was extended from 10 to 20 years. This substantial reduction of the annual installments permits the entryman to employ his caiptal to a

much greater advantage in preparing his land for cultivation and securing the necessary implements and stock for the proper development of his land.

(4) The enlarged-homestead act was amended March 3, 1915 (38 Stat., 956), so as to permit an additional entry thereunder to be made, although proof may already have been submitted on the original. The original enlarged-homestead act restricted the right of additional entry to cases where proof had not been submitted on the original entry, and to that extent made a distinction which was regarded as an unnecessary limitation as to the rights of homesteaders who had theretofore made entries and submitted proof thereon.

(5) The increasing difficulties which are encountered by desert-land entrymen in securing a sufficient supply of water to effect reclamation of their land, due to the general appropriation of the waters in all of the smaller streams is recognized and provision made therefor in the act of March 4, 1915 (38 Stat., 1138), granting a further extension of time within which the entryman can show compliance with the desert-land law or secure an entry of the lands by perfecting his entry in the manner required by the homestead law.

(6) It has frequently transpired that homestead entries have been made within reclamation projects, and that ultimately it was found that the land so entered was not susceptible of reclamation, and to relieve this situation the act of March 4, 1915 (38 Stat., 1215), was enacted by which in cases of this kind the entryman is permitted to select and make a new entry of any farm unit within such irrigation project as may be finally established with credit on the new entry for the time of bona fide residence maintained on the original entry. This measure of relief was regarded as necessary to cover cases where entries were made prior to the time when it could be determined just what lands would receive water under the irrigation project.

(7) The Secretary of the Interior may well congratulate himself upon the substantial progress that has been made by the Sixty-third Congress along the lines of legislation suggested in his annual report for 1913 in providing two important measures for the development of the resources of Alaska, which hitherto have remained practically excluded from the reach of the average pioneer citizen of our States—the coal-leasing act of October 20, 1914 (38 Stat., 741), and the act of March 12, 1914 (38 Stat., 305), authorizing the President of the United States to locate, construct, and operate railroads in the Territory of Alaska. The acts are each the complement of the other, and together serve a common purpose. With railroad connections opened up from the southern coast of Alaska to the interior, the first great step will have been taken toward a permanent occupation of the Territory and its ultimate development to statehood.

(8) By the remedial act of January 11, 1915 (38 Stat., 792), validating placer locations of phosphate deposits, Congress not only relieved the department of a troublesome line of litigation, as between rival claimants, but gave relief to a large number of claimants who had theretofore been confronted with the possibility of losing the results of their previous expenditure of time, labor, and money through an honest mistake, in attempting to protect their discoveries of the mineral phosphate under a placer instead of a lode location.

The peculiar geologic conditions in which beds of phosphate occur are such that much difference of opinion existed for a considerable time as to whether they were properly lode or placer deposits; and in the meantime claims were in equally good faith asserted under both lode and placer locations. The courts and the department finally held, however, that phosphate rock was only locatable as a lode, the result of which conclusion was to endanger all placer locations of phosphate, although made in the best of good faith. This act deals with the condition thus brought about and provides substantially that where placer locations of phosphate rock have heretofore been made and the law thereafter duly complied with, such locations shall be valid, and patents, whether heretofore or hereafter issued thereon, shall give title to and possession of such deposits. Exceptions are made in the case of locations made after the withdrawal of phosphate lands from location, or to locations in conflict with adverse claims. But even with these exceptions a large measure of relief has been granted to this exceedingly deserving class of claims which otherwise might have failed of confirmation.

PROPOSED LEGISLATION.

The attitude of the present administration with respect to legislation tending to the more effective development of our public lands is quite as fully disclosed in some measures that failed of passage as in those that are now found in our statute books, and is well illustrated by the bill H. R. 15799, introduced in the Sixty-third Congress by the Member from New Mexico. This bill was for the purpose of providing for the disposition of grazing lands under the homestead law, and was generally known as the stock-raising homestead. In the course of its consideration before the House committee the Secretary of the Interior submitted two reports, covering the subject very fully, and expressing a favorable view upon the general proposition, taking the ground that, inasmuch as there yet remained vast areas of the public lands to which none of the present homestead laws are well adapted, legislation which would make available for homestead purposes lands more suitable for grazing than other uses should be covered by appropriate legislation.

The bill passed the House of Representatives January 18, 1915, received a favorable report from the Senate Committee on Public Lands, but failed of passage in the Senate.

Constructive legislation in a new field was also proposed by the department with respect to the disposition of our water-power sites. This measure was practically without opposition in the House of Representatives and was adopted under bill H. R. 16673, which passed the House August 24, 1914, received a favorable report from the Senate committee, but failed of passage in the Senate. The measure, as thus defined, is based upon a recognition of the ownership of and the right of control in the States to the use of the waters in the flowing streams of the States, and where the land adjacent to such streams is necessary for the location of power sites the bill recognized the necessity of cooperation between the States, which control the water, and the United States, which owns the land, and made due provision for the safety of investments for the development of power projects, as well as the complete control by the Federal Government. The importance of legislation of this kind is a matter of comparatively recent legislation, but has now, past all doubt, reached a point from which it will henceforth persist until it finds expression in statutory enactment.

Another measure which the present administration of the Interior Department actively advocated was a general leasing bill to cover lands containing coal, oil, phosphates, and potash. The present laws regulating the disposition of our mineral lands are wholly inadequate in providing for the proper exploitation of these minerals. This is particularly true in the location and development of oil lands. The great expense and uncertainty attendant upon the actual discovery of oil calls for remedial legislation that will in some degree furnish protection during the period of development and prior to discovery.

If a lease of a considerable area, say 2,560 acres, as proposed in this bill, could be secured by coal operators, it would doubtless remove one of the most active inducements to violations of the present law, in seeking to secure unlawfully a larger area than can now be purchased by one person or association, and which in fact is required if coal mining is made fairly profitable. The general withdrawals of lands containing phosphates call for appropriate legislation under which this mineral may be mined and placed upon the market.

Like the power-site bill, this measure met with favor in the House and received its approval, but failed of passage in the Senate.

THE HOMESTEAD LAW IN OPERATION.

The actual investment made by homestead entrymen prior to final proof, as well as the extent of cultivation, has lately been made the subject of study in this office, and some exceedingly significant figures

have been obtained. The method adopted in this investigation was to compile the data from the final proofs submitted on 10 homestead entries, taken at random from each of the 95 districts of the public-land States, in comparatively recent cases.

These final proofs necessarily include all kinds and varieties of homestead entries, but, for the purpose in hand, no distinction in that particular was made, and it is found that a total of 26,297 acres were cultivated in the entire 950 claims, and the total value of the improvements placed thereon estimated at $751,151, so that the average cultivation per entry as thus disclosed is 27 acres, and the average value of improvements thereon is $790.

The substantial development of homestead claims disclosed by this investigation is thought to be a fair demonstration of the general good faith of claimants under the agricultural laws, especially when it is remembered that for the most part they are largely dependent upon the labor of their own hands, not only for the improvement of the land but for their actual subsistence.

One form of homestead entry, known as the enlarged homestead, which permits taking 320 acres of semiarid grazing lands, has also been made, and is at the present time being made, the subject of study to determine whether its operation results in the actual development of the land by the homesteader or is made use of to secure large tracts for speculative purposes.

Reports along this line have been called for through the field service and we have responses therefrom down to date. While a considerable difference of opinion is expressed in these reports as to the operation of this law, which can only be gathered by a comparative study of all the reports, it may be said that the general trend is toward a conclusion favorable to the law, largely from the fact that lands of this character lend themselves to stock-raising and grazing propositions which the farmer can not prosecute upon a lesser body of lands of this character.

The purpose of the two studies just referred to, which are now being prosecuted in this office, is to determine whether our public-land laws require any modifications by which a higher degree of development of our public lands can be secured, or whether present methods of administration are calculated to secure the best results under existing laws.

LEGISLATION.

(1) By reference to the annual report of 1913 it will be found that legislation looking toward the consolidation and simplification of the various right-of-way acts was recommended with the outline of the essential features to be covered thereby.

The necessity for this legislation has only increased with the lapse of time. The recommendation as heretofore made will not be repeated in detail, but the purpose of the office is to present to the department such a bill as will afford the needed relief in this direction.

(2) The act of August 24, 1912 (37 Stat., 512), entitled "An act to create a legislative assembly in the Territory of Alaska, to confer legislative power thereon, and for other purposes," provides that the Constitution of the United States, and the laws thereof which are not locally inapplicable shall have the same force and effect within said Territory as otherwise within the United States.

This office and the department have already encountered serious difficulties in determining the applicability of the right-of-way laws in the Territory under the above provision. So far as this particular question is concerned, an opinion of the Attorney General has relieved the present situation, but it is deemed wise to suggest that Congress should pass an act expressing with more detail and certainty what public-land laws of the United States are applicable to Alaska rather than to leave such matter open to interpretation.

(3) Under the regulations heretofore existing and the decisions of the department it has uniformly been held that the title taken to railroad rights of way, by special acts, such as the Pacific grants, was merely an easement and did not convey a title in fee.

It is now held by the department, following the decisions of the United States Supreme Court, that the title thus conferred is something more than a mere easement—is, in fact, a base or limited fee.

It follows as a natural consequence of this holding that if the Government by legislative enactment has parted with the title it has no authority or right, either legal or equitable, to patent to subsequent applicants any portion of the land so alienated.

Nevertheless under the former holding that the right of way constituted simply an easement the office has heretofore issued and is yet issuing patents to lands charged with the base or qualified fee acquired under the right-of-way act. To correct the situation thus arising and to confer authority upon the department to make the proper disposition of lands covered by rights of way in the event of their abandonment or forfeiture requires specific legislative action.

(4) In the last annual report very full consideration was given to the operation of the act of August 18, 1894 (28 Stat., 372), known as the Carey Act, and the status of the work then in hand, followed by suggestions as to appropriate legislation to the end that the projects already begun and those now in contemplation might both be carried to consummation.

In the year that is passed, however, much attention has been given to the general subject of the irrigation and reclamation of our arid

lands, both in the department and among representatives of the various irrigation States, all looking to the formulation of such further constructive measures, through cooperation between the States and the Federal Government, as will secure a more effective and comprehensive plan of dealing with this subject.

For this reason it is therefore thought best at the present time to make no specific recommendation with respect to the "Carey Act," but rather to await the results of the contemplated cooperation above indicated. If, however, it shall transpire that no radical measures along this line seem likely to be suggested, I will renew my recommendations contained in the former report and present for your consideration proposed legislation to that end.

CONCLUSION.

On the whole, the office statistics show that the work of this bureau is more nearly current in all its branches than at any time during my administration. Moreover, the quantity of work actually accomplished is equal to if not greater than in previous years, though owing to new legislation and the policy inaugurated during recent years, the administration of the public-land laws is becoming increasingly complex and difficult.

Aside from the regular routine work, the office has been able to make much real, substantial progress in the settlement and disposition of the larger problems and situations—several of which are referred to in this report—that confronted the Land Office. Many of these problems have required careful study of involved questions of law, long and detailed compilations of office records, and extensive field investigations which, for the most part, do not appear at all in the statistical report, in order to arrive at just and intelligent conclusions.

CLAY TALLMAN, *Commissioner.*

The SECRETARY OF THE INTERIOR.

STATISTICS RELATING TO THE DISPOSITION OF THE PUBLIC DOMAIN.

Area of States and Territories.

[Based upon careful joint calculations made in the General Land Office, the Geological Survey and the Bureau of the Census.]

State or Territory.	Land surface.		Water surface.		Total areas.	
	Sq. m.	*Acres.*	*Sq. m.*	*Acres.*	*Sq. m.*	*Acres.*
Alabama	51,279	32,818,560	719	460,160	51,998	33,278,720
Arizona	113,810	72,838,400	146	93,440	113,956	72,931,840
Arkansas	52,525	33,616,000	810	518,400	53,335	34,134,400
California	155,652	99,617,280	2,645	1,692,800	158,297	101,310,080
Colorado	103,658	66,341,120	290	185,600	103,948	66,526,720
Connecticut	4,820	3,084,800	145	92,800	4,965	3,177,600
Delaware	1,965	1,257,600	405	259,200	2,370	1,516,800
District of Columbia	60	38,400	10	6,400	70	44,800
Florida	54,861	35,111,040	3,805	2,435,200	58,666	37,546,240
Georgia	58,725	37,584,000	540	345,600	59,265	37,929,600
Idaho	83,354	53,346,560	534	341,760	83,888	53,688,320
Illinois	56,043	35,867,520	622	398,080	56,665	36,265,600
Indiana	36,045	23,068,800	309	197,760	36,354	23,266,560
Iowa	55,586	35,575,040	561	359,040	56,147	35,934,080
Kansas	81,774	52,335,360	384	245,760	82,158	52,581,120
Kentucky	40,181	25,715,840	417	266,880	40,598	25,982,720
Louisiana	45,409	29,061,760	3,097	1,982,080	48,506	31,043,840
Maine	29,895	19,132,800	3,145	2,012,800	33,040	21,145,600
Maryland	9,941	6,362,240	2,386	1,527,040	12,327	7,889,280
Massachusetts	8,039	5,144,960	227	145,280	8,266	5,290,240
Michigan	57,480	36,787,200	500	320,000	57,980	37,107,200
Minnesota	80,858	51,749,120	3,824	2,447,360	84,682	54,196,480
Mississippi	46,362	29,671,680	503	321,920	46,865	29,993,600
Missouri	68,727	43,985,280	693	443,520	69,420	44,428,800
Montana	146,201	93,568,640	796	509,440	146,997	94,078,080
Nebraska	76,808	49,157,120	712	455,680	77,520	49,612,800
Nevada	109,821	70,285,440	869	556,160	110,690	70,841,600
New Hampshire	9,031	5,779,840	310	198,400	9,341	5,978,240
New Jersey	7,514	4,808,960	710	454,400	8,224	5,263,360
New Mexico	122,503	78,401,920	131	83,840	122,634	78,485,760
New York	47,654	30,498,560	1,550	992,000	49,204	31,490,560
North Carolina	48,740	31,193,600	3,686	2,359,040	52,426	33,552,640
North Dakota	70,183	44,917,120	654	418,560	70,837	45,335,680
Ohio	40,740	26,073,600	300	192,000	41,040	26,265,600
Oklahoma	69,414	44,424,960	643	411,520	70,057	44,836,480
Oregon	95,607	61,188,480	1,092	698,880	96,699	61,887,360
Pennsylvania	44,832	28,692,480	294	188,160	45,126	28,880,640
Rhode Island	1,067	682,880	181	115,840	1,248	798,720
South Carolina	30,495	19,516,800	494	316,160	30,989	19,832,960
South Dakota	76,868	49,195,520	747	478,080	77,615	49,673,600
Tennessee	41,687	26,679,680	335	214,400	42,022	26,894,080
Texas	262,398	167,934,720	3,498	2,238,720	265,896	170,173,440
Utah	82,184	52,597,760	2,806	1,795,840	84,990	54,393,600
Vermont	9,124	5,839,360	440	281,600	9,564	6,120,960
Virginia	40,262	25,767,680	2,365	1,513,600	42,627	27,281,280
Washington	66,836	42,775,040	2,291	1,466,240	69,127	44,241,280
West Virginia	24,022	15,374,080	148	94,720	24,170	15,468,800
Wisconsin	55,256	35,363,840	810	518,400	56,066	35,882,240
Wyoming	97,594	62,460,160	320	204,800	97,914	62,664,960
	2,973,890	1,903,289,600	52,899	33,855,360	3,026,789	1,937,144,960
Alaska					590,884	378,165,760
Guam					210	134,400
Hawaii					6,449	4,127,360
Canal Zone					436	279,040
Philippine Islands					115,026	73,616,640
Porto Rico					3,435	2,198,400
American Samoa					77	49,280
Total					3,743,306	2,395,715,840

Owing to their location adjoining the Great Lakes, the States enumerated below contain approximately an additional number of square miles as follows: Illinois, 1,674 square miles of Lake Michigan; Indiana, 230 square miles of Lake Michigan; Michigan, 16,653 square miles of Lake Superior, 12,922 square miles of Lake Michigan, 9,925 square miles of Lake Huron, and 460 square miles of Lakes St. Clair and Erie; Minnesota, 2,514 square miles of Lake Superior; New York, 3,140 square miles of Lakes Ontario and Erie; Ohio, 3,443 square miles of Lake Erie; Pennsylvania, 891 square miles of Lake Erie; Wisconsin, 2,378 square miles of Lake Superior and 7,500 square miles of Lake Michigan.

In addition to the water areas noted above, California claims jurisdiction over all Pacific waters lying within 3 English miles of her coast; Oregon claims jurisdiction over a similar strip of the Pacific Ocean 1 marine league in width between latitude 42° north and the mouth of the Columbia River; and Texas claims jurisdiction over a strip of Gulf water 3 leagues in width, adjacent to her coast and between the Rio Grande and the Sabine River.

United States district land offices.

Locations.	Established.	Opened.
Alabama:		
Montgomery	July 10, 1832	Jan. 1, 1834
Alaska:		
Fairbanks	May 14, 1907	July 1, 1907
Juneau	Apr. 2, 1902	June 20, 1902
Nome	May 14, 1907	July 1, 1907
Arizona:		
Phoenix	July 25, 1905	Oct. 2, 1905
Arkansas:		
Camden	Jan. 10, 1871	Mar. 20, 1871
Harrison	July 14, 1870	Feb. 27, 1871
Little Rock	Feb. 17, 1818	Sept. 1, 1821
California:		
Eureka	Mar. 29, 1858	July 24, 1858
Independence	Apr. 22, 1886	Mar. 22, 1887
Los Angeles	June 12, 1869	Sept. 22, 1869
Sacramento	July 26, 1866	Nov. 12, 1867
San Francisco	Mar. 4, 1911	May 1, 1911
Susanville	Feb. 10, 1871	Mar. 2, 1871
Visalia	Mar. 29, 1858	July 10, 1858
Colorado:		
Del Norte	June 20, 1874	Mar. 22, 1875
Denver	June 4, 1864	Aug. 15, 1864
Durango	Apr. 20, 1882	Oct. 2, 1882
Glenwood Springs	July 3, 1884	Nov. 10, 1884
Hugo	Feb. 6, 1890	Sept. 7, 1890
Lamar	Aug. 4, 1886	Jan. 3, 1887
Leadville	Apr. 5, 1879	July 1, 1879
Montrose	Jan. 4, 1888	Sept. 1, 1888
Pueblo	May 27, 1870	Jan. 16, 1871
Sterling	Feb. 6, 1890	Aug. 1, 1890
Florida:		
Gainesville	June 8, 1872	Apr. 30, 1873
Idaho:		
Blackfoot	Sept. 3, 1886	Nov. 16, 1886
Boise	July 26, 1866	Jan. 13, 1868
Coeur d'Alene	July 14, 1884	Dec. 21, 1885
Hailey	Jan. 24, 1883	July 16, 1883
Lewiston	July 26, 1866	Sept. 26, 1871
Kansas:		
Dodge City	Dec. 20, 1893	Feb. 3, 1894
Topeka	July 24, 1861	Sept. 10, 1861
Louisiana:		
Baton Rouge	Jan. 6, 1911	Apr. 1, 1911
Michigan:		
Marquette	Mar. 19, 1857	July 14, 1857
Minnesota:		
Cass Lake	Apr. 1, 1908	July 1, 1908
Crookston	Apr. 29, 1878	May 5, 1879
Duluth	Mar. 27, 1862	Jan. 15, 1863
Mississippi:		
Jackson	June 23, 1836	July 25, 1836
Missouri:		
Springfield	June 26, 1834	Oct. 4, 1838
Montana:		
Billings	Feb. 5, 1906	July 2, 1906
Bozeman	June 20, 1874	Oct. 5, 1874
Glasgow	Feb. 26, 1907	June 1, 1907
Great Falls	May 8, 1902	Aug. 1, 1902
Havre	Mar. 15, 1910	July 1, 1910
Helena	Mar. 2, 1867	Apr. 27, 1867
Kalispell	Mar. 2, 1897	July 1, 1897
Montana—Contd.		
Lewistown	Apr. 1, 1890	Nov. 26, 1890
Miles City	Apr. 30, 1880	Oct. 19, 1880
Missoula	Apr. 1, 1890	Apr. 20, 1891
Nebraska:		
Alliance	Apr. 16, 1890	July 1, 1890
Broken Bow	....do....	July 7, 1890
Lincoln	July 7, 1868	Sept. 7, 1868
North Platte	Apr. 22, 1872	Apr. 11, 1873
O'Neill	Apr. 7, 1888	July 16, 1888
Valentine	June 19, 1882	July 7, 1883
Nevada:		
Carson City	July 2, 1862	Mar. 1, 1864
Elko	Oct. 3, 1913	Jan. 1, 1914
New Mexico:		
Clayton	Dec. 18, 1888	Aug. 12, 1889
Fort Sumner	June 22, 1910	Oct. 1, 1910
Las Cruces	Mar. 10, 1863	May 1, 1863
Roswell	Mar. 1, 1889	Dec. 9, 1889
Santa Fe	May 24, 1858	Nov. 24, 1858
Tucumcari	Mar. 16, 1908	July 1, 1908
North Dakota:		
Bismarck	Apr. 24, 1874	Oct. 12, 1874
Dickinson	Mar. 16, 1904	July 1, 1904
Minot	Sept. 26, 1890	Oct. 1, 1891
Williston	Apr. 26, 1906	Aug. 1, 1906
Oklahoma:		
Guthrie	Mar. 3, 1889	Apr. 22, 1889
Woodward	Aug. 25, 1893	Sept. 16, 1893
Oregon:		
Burns	June 1, 1889	Sept. 2, 1889
La Grande	July 3, 1866	Nov. 15, 1867
Lakeview	June 6, 1877	Aug. 6, 1877
Portland	Aug. 24, 1854	Jan. 1, 1855
Roseburg	Sept. 15, 1850	Jan. 3, 1860
The Dalles	Jan. 11, 1875	June 1, 1875
Vale	Mar. 15, 1910	July 1, 1910
South Dakota:		
Timber Lake	Feb. 12, 1911	May 1, 1911
Bellefourche	Feb. 6, 1909	July 1, 1909
Gregory	July 14, 1890	Jan. 3, 1892
Lemmon	May 29, 1908	Aug. 1, 1908
Pierre	Feb. 10, 1890	May 12, 1890
Rapid City	Dec. 13, 1888	Jan. 15, 1889
Utah:		
Salt Lake City	July 16, 1866	Nov. 1, 1868
Vernal	May 9, 1905	July 1, 1905
Washington:		
North Yakima	Apr. 11, 1885	Apr. 24, 1885
Seattle	June 27, 1887	Dec. 3, 1887
Spokane	June 23, 1883	Oct. 1, 1883
Vancouver	May 16, 1860	July 3, 1861
Walla Walla	Mar. 3, 1871	July 17, 1871
Waterville	May 16, 1890	Nov. 6, 1890
Wisconsin:		
Wausau	June 19, 1872	Aug. 19, 1872
Wyoming:		
Buffalo	Mar. 3, 1887	May 1, 1888
Cheyenne	Feb. 5, 1870	Aug. 10, 1870
Douglas	Apr. 23, 1890	Nov. 1, 1890
Evanston	Aug. 9, 1876	Aug. 13, 1877
Lander	Apr. 23, 1890	Nov. 8, 1890
Sundance	Apr. 3, 1890	Oct. 27, 1890

NOTE.—The land offices in Ohio, Indiana, Illinois, and Iowa are abolished, and the vacant tracts of public lands in those States are subject to entry and location at the General Land Office, Washington, D. C.

List of offices of United States surveyors general.

Locations.	Established.	Locations.	Established.
Alaska: Juneau	May 17, 1884	New Mexico: Santa Fe	Mar. 2, 1867
Arizona: Phoenix	Feb. 24, 1863	Oregon: Portland	July 17, 1884
California: San Francisco	Mar. 3, 1851	South Dakota: Huron	Apr. 10, 1890
Colorado: Denver	Feb. 28, 1861	Utah: Salt Lake City	July 16, 1868
Idaho: Boise	June 29, 1866	Washington: Olympia	July 17, 1884
Montana: Helena	July 2, 1884	Wyoming: Cheyenne	Feb. 5, 1870
Nevada: Reno	July 4, 1866		

Field division headquarters of special agents of General Land Office.

Field division:	
Portland	Portland, Oreg.
San Francisco	San Francisco, Cal.
Alaska	Juneau, Alaska.
Helena	Helena, Mont.
Denver	Denver, Colo.
Cheyenne	Cheyenne, Wyo.
Southern	Jackson, Miss.
Salt Lake City	Salt Lake City, Utah.
Santa Fe	Santa Fe, N. Mex.

Present organization General Land Office.

A. Administrative duties. Appointments; bonds of officials, except mineral surveyors; correspondence concerning local officers, surveyors general, etc.; establishment of new land districts, changes in location of district land offices, changes in district boundary lines, discontinuance of local land offices; publication of notices of intention to offer final proof; opening and sale of Indian reservations; printing and binding; bird reservations; national monuments; leaves of absences; requisitions for supplies; record of attorneys and agents admitted before department and its bureaus, also before district land offices.

B. Record of patents; use of rectigraph and photostat machines in making photographic copies of papers.

C. Homesteads, all original, except forest and reclamation; final homesteads; commuted homesteads; homestead declaratory statements; timber and stone entries; public sales; isolated tracts; certified copies; private sale, lands in Missouri.

D. Mails and files.

E. Surveys.

F. Railroad grants; cash sales under act providing for adjustment of railroad grants; wagon roads, rights of way for canals, ditches, etc.; reservoir declaratory statements, State selections (Carey Act).

G. Desert-land entries, original and final; State selections (except Carey Act); Indian allotments and Indian homesteads; swamp lands.

H. Contests.

K. Reclamation; preemption; homesteads in national forests; town sites; military bounty land warrants; abandoned military reservations; agricultural college and other similar scrip; lieu selections; graduation and credit system entries; private land claims; Minnesota drainage; Chippewa logging—Minnesota.

L. Drafting; forest reserve eliminations, restorations, etc.; national monument files; compilation of United States and other maps; blue printing; mounting of maps and plats.

M. Accounts; repayments; monthly schedules; statistics.

N. Mineral entries; contests involving character of land; protests in mineral cases; coal, oil, phosphate and potash withdrawals and restorations; Northern Pacific classification; mineral segregation plats; bonds of mineral surveyors.

O. Posting, tract books.

FS. Soldiers' additional homesteads; fraudulent entries; timber trespass; unlawful inclosure public domain; suits to set aside patents; disbarment of attorneys and agents.

Average number of employees of the General Land Office, July 1, 1915.

In General Land Office, Washington, D. C.	536
In 13 offices of surveyors general	189
In 99 district land offices	408
In the field service	150
In the surveying service	144
In logging service	38
Town-site trustees	4
Custodians	9
Total	1,478

Final homestead entries from the passage of the homestead act to June 30, 1915.

Fiscal year ended June 30—	Number.	Acres.	Fiscal year ended June 30—	Number.	Acres.
1868	2,772	355,086.04	1893	24,204	3,477,231.63
1869	3,965	504,301.97	1894	20,544	2,929,947.41
1870	4,041	519,727.84	1895	20,922	2,980,809.30
1871	5,087	629,162.25	1896	20,099	2,790,242.55
1872	5,917	707,409.83	1897	20,115	2,778,404.20
1873	10,311	1,224,890.93	1898	22,281	3,095,017.75
1874	14,129	1,585,781.56	1899	22,812	3,134,140.44
1875	18,393	2,068,537.74	1900	25,286	3,477,842.71
1876	22,530	2,590,552.81	1901	37,568	5,241,120.76
1877	19,900	2,407,828.19	1902	31,327	4,342,747.70
1878	22,460	2,662,980.82	1903	26,373	3,576,964.14
1879	17,391	2,070,842.39	1904	23,932	3,232,716.75
1880	15,141	1,938,234.89	1905	24,821	3,419,387.15
1881	15,077	1,928,204.76	1906	25,546	3,526,748.58
1882	17,174	2,219,453.80	1907	26,485	3,740,567.71
1883	18,998	2,504,414.51	1908	29,936	4,242,710.59
1884	21,343	2,945,574.72	1909	25,510	3,699,466.79
1885	22,066	3,032,679.11	1910	23,253	3,795,862.89
1886	19,356	2,663,531.83	1911	25,908	4,620,197.12
1887	19,866	2,749,037.48	1912	24,326	4,306,068.52
1888	22,413	3,175,400.64	1913	53,252	10,009,285.16
1889	25,549	3,681,708.80	1914	48,724	9,291,121.46
1890	28,090	4,060,592.77	1915	37,343	7,180,981.62
1891	27,686	3,954,587.77			
1892	22,322	3,259,897.07	Total	1,063,534	154,327,812.45

Timber and stone entries from the passage of the act of June 3, 1878, to June 30, 1915.

State or Territory.	Entries.	Area.	Amount.
		Acres.	
Alabama	329	26,331.35	$71,598.48
Arizona	4	360.00	900.00
Arkansas	2,197	296,496.01	602,236.66
California	20,193	2,815,307.30	7,149,376.92
Colorado	2,895	356,798.61	910,633.50
Florida	908	102,930.66	284,861.95
Idaho	7,322	962,819.52	2,539,963.43
Louisiana	1,565	138,936.90	363,581.33
Michigan	1,665	137,304.56	350,362.44
Minnesota	12,338	1,387,267.81	3,492,352.17
Mississippi	89	6,436.38	16,790.12
Montana	4,941	636,901.07	1,637,141.02
Nebraska	1	97.20	243.00
Nevada	49	6,222.32	15,558.19
North Dakota	81	8,646.31	22,005.78
Oklahoma	1	40.00	100.00
Oregon	26,197	3,730,183.34	9,459,440.52
South Dakota	563	61,700.19	158,601.17
Utah	28	2,920.60	7,011.42
Washington	16,100	2,135,074.48	5,407,631.77
Wisconsin	1,076	78,498.77	197,041.40
Wyoming	3,377	381,638.59	942,752.56
Total	102,919	13,289,906.97	33,630,183.53

The bill passed the House of Representatives January 18, 1915, received a favorable report from the Senate Committee on Public Lands, but failed of passage in the Senate.

Constructive legislation in a new field was also proposed by the department with respect to the disposition of our water-power sites. This measure was practically without opposition in the House of Representatives and was adopted under bill H. R. 16673, which passed the House August 24, 1914, received a favorable report from the Senate committee, but failed of passage in the Senate. The measure, as thus defined, is based upon a recognition of the ownership of and the right of control in the States to the use of the waters in the flowing streams of the States, and where the land adjacent to such streams is necessary for the location of power sites the bill recognized the necessity of cooperation between the States, which control the water, and the United States, which owns the land, and made due provision for the safety of investments for the development of power projects, as well as the complete control by the Federal Government. The importance of legislation of this kind is a matter of comparatively recent legislation, but has now, past all doubt, reached a point from which it will henceforth persist until it finds expression in statutory enactment.

Another measure which the present administration of the Interior Department actively advocated was a general leasing bill to cover lands containing coal, oil, phosphates, and potash. The present laws regulating the disposition of our mineral lands are wholly inadequate in providing for the proper exploitation of these minerals. This is particularly true in the location and development of oil lands. The great expense and uncertainty attendant upon the actual discovery of oil calls for remedial legislation that will in some degree furnish protection during the period of development and prior to discovery.

If a lease of a considerable area, say 2,560 acres, as proposed in this bill, could be secured by coal operators, it would doubtless remove one of the most active inducements to violations of the present law, in seeking to secure unlawfully a larger area than can now be purchased by one person or association, and which in fact is required if coal mining is made fairly profitable. The general withdrawals of lands containing phosphates call for appropriate legislation under which this mineral may be mined and placed upon the market.

Like the power-site bill, this measure met with favor in the House and received its approval, but failed of passage in the Senate.

THE HOMESTEAD LAW IN OPERATION.

The actual investment made by homestead entrymen prior to final proof, as well as the extent of cultivation, has lately been made the subject of study in this office, and some exceedingly significant figures

have been obtained. The method adopted in this investigation was to compile the data from the final proofs submitted on 10 homestead entries, taken at random from each of the 95 districts of the public-land States, in comparatively recent cases.

These final proofs necessarily include all kinds and varieties of homestead entries, but, for the purpose in hand, no distinction in that particular was made, and it is found that a total of 26,297 acres were cultivated in the entire 950 claims, and the total value of the improvements placed thereon estimated at $751,151, so that the average cultivation per entry as thus disclosed is 27 acres, and the average value of improvements thereon is $790.

The substantial development of homestead claims disclosed by this investigation is thought to be a fair demonstration of the general good faith of claimants under the agricultural laws, especially when it is remembered that for the most part they are largely dependent upon the labor of their own hands, not only for the improvement of the land but for their actual subsistence.

One form of homestead entry, known as the enlarged homestead, which permits taking 320 acres of semiarid grazing lands, has also been made, and is at the present time being made, the subject of study to determine whether its operation results in the actual development of the land by the homesteader or is made use of to secure large tracts for speculative purposes.

Reports along this line have been called for through the field service and we have responses therefrom down to date. While a considerable difference of opinion is expressed in these reports as to the operation of this law, which can only be gathered by a comparative study of all the reports, it may be said that the general trend is toward a conclusion favorable to the law, largely from the fact that lands of this character lend themselves to stock-raising and grazing propositions which the farmer can not prosecute upon a lesser body of lands of this character.

The purpose of the two studies just referred to, which are now being prosecuted in this office, is to determine whether our public-land laws require any modifications by which a higher degree of development of our public lands can be secured, or whether present methods of administration are calculated to secure the best results under existing laws.

LEGISLATION.

(1) By reference to the annual report of 1913 it will be found that legislation looking toward the consolidation and simplification of the various right-of-way acts was recommended with the outline of the essential features to be covered thereby.

The necessity for this legislation has only increased with the lapse of time. The recommendation as heretofore made will not be repeated in detail, but the purpose of the office is to present to the department such a bill as will afford the needed relief in this direction.

(2) The act of August 24, 1912 (37 Stat., 512), entitled "An act to create a legislative assembly in the Territory of Alaska, to confer legislative power thereon, and for other purposes," provides that the Constitution of the United States, and the laws thereof which are not locally inapplicable shall have the same force and effect within said Territory as otherwise within the United States.

This office and the department have already encountered serious difficulties in determining the applicability of the right-of-way laws in the Territory under the above provision. So far as this particular question is concerned, an opinion of the Attorney General has relieved the present situation, but it is deemed wise to suggest that Congress should pass an act expressing with more detail and certainty what public-land laws of the United States are applicable to Alaska rather than to leave such matter open to interpretation.

(3) Under the regulations heretofore existing and the decisions of the department it has uniformly been held that the title taken to railroad rights of way, by special acts, such as the Pacific grants, was merely an easement and did not convey a title in fee.

It is now held by the department, following the decisions of the United States Supreme Court, that the title thus conferred is something more than a mere easement—is, in fact, a base or limited fee.

It follows as a natural consequence of this holding that if the Government by legislative enactment has parted with the title it has no authority or right, either legal or equitable, to patent to subsequent applicants any portion of the land so alienated.

Nevertheless under the former holding that the right of way constituted simply an easement the office has heretofore issued and is yet issuing patents to lands charged with the base or qualified fee acquired under the right-of-way act. To correct the situation thus arising and to confer authority upon the department to make the proper disposition of lands covered by rights of way in the event of their abandonment or forfeiture requires specific legislative action.

(4) In the last annual report very full consideration was given to the operation of the act of August 18, 1894 (28 Stat., 372), known as the Carey Act, and the status of the work then in hand, followed by suggestions as to appropriate legislation to the end that the projects already begun and those now in contemplation might both be carried to consummation.

In the year that is passed, however, much attention has been given to the general subject of the irrigation and reclamation of our arid

lands, both in the department and among representatives of the various irrigation States, all looking to the formulation of such further constructive measures, through cooperation between the States and the Federal Government, as will secure a more effective and comprehensive plan of dealing with this subject.

For this reason it is therefore thought best at the present time to make no specific recommendation with respect to the "Carey Act," but rather to await the results of the contemplated cooperation above indicated. If, however, it shall transpire that no radical measures along this line seem likely to be suggested, I will renew my recommendations contained in the former report and present for your consideration proposed legislation to that end.

CONCLUSION.

On the whole, the office statistics show that the work of this bureau is more nearly current in all its branches than at any time during my administration. Moreover, the quantity of work actually accomplished is equal to if not greater than in previous years, though owing to new legislation and the policy inaugurated during recent years, the administration of the public-land laws is becoming increasingly complex and difficult.

Aside from the regular routine work, the office has been able to make much real, substantial progress in the settlement and disposition of the larger problems and situations—several of which are referred to in this report—that confronted the Land Office. Many of these problems have required careful study of involved questions of law, long and detailed compilations of office records, and extensive field investigations which, for the most part, do not appear at all in the statistical report, in order to arrive at just and intelligent conclusions.

CLAY TALLMAN, *Commissioner.*

The SECRETARY OF THE INTERIOR.

Land and scrip granted to States and Territories for educational and other purposes—Con.

State or Territory.	Purpose of grant.	Amount granted.	Total by States.
		Acres.	
Nebraska	Penitentiary	32,000.00	
	Internal improvements	500,000.00	
	University	46,080.00	
	Public buildings	12,800.00	
	Agricultural College	90,000.00	
	Common schools, sections 16 and 36	2,730,951.00	
	Salt Springs and contiguous lands	46,080.00	
			3,457,911.00
Nevada	Internal improvements	500,000.00	
	University	46,080.00	
	Penitentiary	12,800.00	
	Public buildings	12,800.00	
	Mining and Mechanic Arts	90,000.00	
	Common schools, sections 16 and 36, and lieu lands, act June 16, 1880.	2,061,967.00	
			2,723,647.00
New Hampshire	Agricultural College scrip	150,000.00	150,000.00
New Jersey	Agricultural College scrip	210,000.00	210,000.00
New Mexico (act June 21, 1898).	University	111,080.00	
	Saline Land (University)	1,622.86	
	Agricultural College	100,000.00	
	Improvement of Rio Grande	100,000.00	
	Penitentiary	50,000.00	
	Public buildings	32,000.00	
	Insane Asylum	50,000.00	
	Deaf and Dumb Asylum	50,000.00	
	Reform School	50,000.00	
	Normal School	100,000.00	
	School of Mines	50,000.00	
	Blind Asylum	50,000.00	
	Reservoirs	500,000.00	
	Miners' Hospital	50,000.00	
	Military Institute	50,000.00	
	Common schools, sections 16 and 36	4,355,662.00	
			5,700,364.86
New Mexico (act June 20, 1910).	University	200,000.00	
	Public buildings	100,000.00	
	Insane asylums	100,000.00	
	Penitentiaries	100,000.00	
	Deaf, Dumb and Blind Asylum	100,000.00	
	Miners' hospitals	50,000.00	
	Normal schools	200,000.00	
	Charitable, penal and reformatory	100,000.00	
	Agricultural and mechanical colleges	150,000.00	
	School of Mines	150,000.00	
	Military institutes	100,000.00	
	Payment of bonds issued by Grant and Santa Fe Counties.	1,000,000.00	
	Common schools, sections 2 and 32	4,355,662.00	
			6,705,662.00
New York	Agricultural College scrip	990,000.00	990,000.00
North Carolina	Agricultural College scrip	270,000.00	270,000.00
North Dakota	University	86,080.00	
	Agricultural College	130,000.00	
	Public buildings	82,000.00	
	Educational, charitable, etc	170,000.00	
	Deaf and Dumb Asylum	40,000.00	
	Reform School	40,000.00	
	School of Mines	40,000.00	
	Normal School	80,000.00	
	Common schools, sections 16 and 36	2,495,396.00	
			3,163,476.00
Ohio	Internal improvements	500,000.00	
	Seminaries of learning	69,120.00	
	Agricultural College scrip	630,000.00	
	Common schools, section 16	724,266.00	
	Salt Springs and contiguous lands	24,216.00	
			1,947,300.00
Oklahoma	Normal schools	300,000.00	
	Oklahoma University	250,000.00	
	University Preparatory School	150,000.00	
	Agricultural and Mechanical College	250,000.00	
	Colored Agricultural and Normal University	100,000.00	
	Common schools, sections 16 and 36	1,375,000.00	
	Certain sections 13 and 33	669,000.00	
			3,094,000.00

Land and scrip granted to States and Territories for educational and other purposes—Con.

State or Territory.	Purpose of grant.	Amount granted.	Total by States.
		Acres.	
Oregon	Internal improvements	500,000.00	
	University	46,080.00	
	Public buildings	6,400.00	
	Agricultural College	90,000.00	
	Common schools, sections 16 and 36	3,399,360.00	
	Salt Springs and contiguous lands	46,080.00	
			4,087,920.00
Pennsylvania	Agricultural College scrip	780,000.00	780,000.00
Rhode Island	Agriculture College scrip	120,000.00	120,000.00
South Carolina	Agricultural College scrip	180,000.00	180,000.00
South Dakota	University	86,080.00	
	Agricultural College	160,000.00	
	Public buildings	82,000.00	
	Educational and charitable	170,000.00	
	Deaf and Dumb Asylum	40,000.00	
	Reform School	40,000.00	
	School of Mines	40,000.00	
	Normal schools	80,000.00	
	Missionary work	160.00	
	Military camp ground	640.00	
	Insane Asylum	640.00	
	Common schools, sections 16 and 36	2,733,084.00	
			3,432,604.00
Tennessee	Agricultural College scrip	300,000.00	300,000.00
Texas	Agricultural College scrip	180,000.00	180,000.00
Utah	University	156,080.00	
	Agricultural College	200,000.00	
	Public buildings	64,000.00	
	Insane Asylum	100,000.00	
	Deaf and Dumb Asylum	100,000.00	
	Reform School	100,000.00	
	School of Mines	100,000.00	
	Normal schools	100,000.00	
	Blind Asylum	100,000.00	
	Reservoirs	500,000.00	
	Miners' Hospital	50,000.00	
	Common schools, sections 2, 16, 32, and 36	5,844,196.00	
			7,414,276.00
Vermont	Agricultural College scrip	150,000.00	150,000.00
Virginia	Agricultural College scrip	300,000.00	300,000.00
Washington	University	46,080.00	
	Agricultural College	90,000.00	
	Public buildings	132,000.00	
	Educational and charitable	200,000.00	
	Normal schools	100,000.00	
	Scientific schools	100,000.00	
	Common schools, sections 16 and 36	2,376,391.00	
			3,044,471.00
West Virginia	Agricultural College scrip	150,000.00	150,000.00
Wisconsin	Internal improvements	500,000.00	
	University	92,160.00	
	Public buildings	6,400.00	
	Agricultural College	240,000.00	
	Forestry	20,000.00	
	Common schools, section 16	982,329.00	
			1,840,889.00
Wyoming	University	46,080.00	
	Agricultural College	90,000.00	
	Public buildings	107,000.00	
	Penitentiary	30,000.00	
	Insane Asylum	30,000.00	
	Educational, penal, etc	290,000.00	
	Deaf and Dumb Asylum	30,000.00	
	Miners' Hospital	30,000.00	
	Fish hatcheries	5,480.00	
	Poor Farm	10,000.00	
	Common schools, sections 16 and 36	3,470,009.00	
			4,138,569.00
Grand total			133,270,428.18

NOTE.—In addition to the above, various States have received in the aggregate, 64,576,522 acres under the swamp land grants. See page 47, this report.

Lands patented or certified under concessions by acts of Congress to States and corporations for railroad and military wagon-road purposes from the year 1850 to June 30, 1915.

STATE GRANTS.

	Acres.
Illinois:	
Illinois Central	2,595,133.00
Mississippi:	
Mobile & Ohio River	[1]737,130.29
Vicksburg & Meridian	199,101.51
Gulf & Ship Island	139,113.22
	1,075,345.02
Alabama:	
Mobile & Ohio River	[1]419,528.44
Alabama & Florida	399,022.84
Selma, Rome & Dalton	458,555.82
Coosa & Tennessee	67,784.96
Mobile & Girard	[2]302,181.16
Alabama & Chattanooga	653,888.76
South & North Alabama	445,478.47
	2,746,440.45
Florida:	
Florida Central & Peninsular	741,668.27
Florida & Alabama	166,691.08
Pensacola & Georgia	1,279,236.70
Florida, Atlantic & Gulf Central	29,384.18
	2,216,980.23
Louisiana:	
Vicksburg, Shreveport & Pacific	371,768.86
New Orleans, Opelousas & Great Western	([3])
Arkansas:	
St. Louis, Iron Mountain & Southern	1,325,355.46
Little Rock & Fort Smith	1,052,082.51
Memphis & Little Rock	184,657.33
	2,562,095.30
Missouri:	
Southwest branch of the Pacific road	1,161,284.51
Hannibal & St. Joseph	611,323.35
St. Louis, Iron Mountain & Southern	65,120.31
	1,837,728.17
Iowa:	
Burlington & Missouri River	389,990.11
Chicago, Rock Island & Pacific	[4]483,214.36
Cedar Rapids & Missouri River	161,532.81 [4]922,824.85 244,022.96
Dubuque & Sioux City	[4]556,406.74
Iowa Falls & Sioux City	683,057.34
Des Moines Valley (river improvement grant)	840,091.36

[1] In the adjustment of this grant the road was treated as an entirety and without reference to the State line; hence Alabama has had approved to her more and Mississippi less than they would appear to be entitled to in proportion to the length of the road in the respective States.

[2] This grant was adjusted Apr. 24, 1893, and 302,181.16 acres were allotted to the company. The balance of the previously certified lands were ordered restored to entry under the forfeiture act of Sept. 29, 1890.

[3] Certified lands footing 719,189.79 acres were reconveyed to the United States by the governor of Louisiana Feb. 24, 1883, the grant having been forfeited by the act of July 14, 1870 (16 Stat., 277).

[4] Includes 35,685.49 acres of the Chicago, Rock Island & Pacific R. R., 109,756.85 acres of the Cedar Rapids & Missouri River R. R., and 77,535.22 acres of the Dubuque & Sioux City R. R., situated in the old Des Moines River grant of Aug. 8, 1846, which should be deducted from the foregoing amount. (Wolcott *v.* Des Moines Co., 5 Wall., 681).

	Acres.
Iowa—Continued.	
Chicago, Milwaukee & St. Paul	326,216.10
McGregor & Missouri River Sioux City & St. Paul	322,412.81
	4,929,769.44
Michigan:	
Port Huron & Lake Michigan	37,467.44
Jackson, Lansing & Saginaw	743,787.58
Grand Rapids & Indiana	852,521.10
Flint & Pere Marquette	512,932.38
Marquette, Houghton & Ontonagon	[1] 305,929.59
Ontonagon & Brule River	34,227.08
Bay de Noquet & Marquette	128,301.05
Chicago & North Western	518,065.36
	3,133,231.58
Wisconsin:	
Chicago, St. Paul, Minneapolis & Omaha (formerly West Wisconsin)	813,706.71
Wisconsin Railroad Farm Mortgage Land Co	163,159.65
Chicago, St. Paul, Minneapolis & Omaha (formerly St. Croix & Lake Superior)	816,487.76
Branch to Bayfield	471,721.14
Chicago & North Western	546,446.20
Wisconsin Central	838,227.69
	3,649,749.15
Minnesota:	
St. Paul, Minneapolis & Manitoba (formerly first division, St. Paul & Pacific) Western Railroad (succeeded by St. Paul & Northern Pacific Railroad Co.) St. Paul, Minneapolis & Manitoba (formerly St. Vincent extension of the St. Paul & Pacific)	[2] 3,258,056.12
Minnesota Central	179,734.29
Winona & St. Peter	1,680,974.92
St. Paul & Sioux City	1,126,578.55
St. Paul & Duluth	860,973.62
Southern Minnesota, from a point on the Mississippi River to Houston Southern Minnesota, extension (now Chicago, Milwaukee & St. Paul)	546,745.44
Hastings & Dakota	377,776.15
	8,030,839.09
Minnesota, North Dakota, Montana, and Washington:	
St. Paul, Minneapolis & Manitoba, now Great Northern (main and branch), a special act (Aug. 5, 1892, 27 Stat. L., 390) to provide for indemnity for lands relinquished by the company	[3]
Kansas:	
Leavenworth, Lawrence & Galveston	[4] 249,446.13
Missouri, Kansas & Texas	[5] 976,593.22
Atchison, Topeka & Santa Fe	2,944,788.14
St. Joseph & Denver City	462,933.24
	4,633,760.73
Grand total of State grants	37,782,841.02

[1] Excess of 131,481.71 acres originally certified under this grant reconveyed by State or entered under act Mar. 3, 1887, by Michigan Land & Iron Co. (Ltd.), grant having been forfeited in part by act Mar. 1889 (25 Stat., 1008).

[2] Declared to be one grant. (See 32 L. D., 21.)

[3] See Minnesota for original grants.

[4] Includes 186,936.72 acres of the "Osage ceded reservation," which are to be deducted from the above amount under the decision of the Supreme Court in the case of the Leavenworth, Lawrence & Galveston Railroad v. The United States (92 U. S., 733).

[5] Includes 270,970.78 acres in the "Osage ceded reservation," which are to be deducted under the decision cited in note 2.

CORPORATION GRANTS.	Acres.
Union Pacific	11,933,776.09
Central Pacific	5,850,567.80
Central Pacific (successor by consolidation with Western Pacific)	458,387.97
Central Branch Union Pacific	223,080.50
Union Pacific (Kansas division)	6,175,660.63
Union Pacific (successor to Denver Pacific Ry. Co.)	807,564.76
Burlington & Missouri River in Nebraska	2,374,090.77
Sioux City & Pacific (now Missouri Valley Land Co.)	42,610.95
Northern Pacific	36,193,011.80
Oregon branch of the Central Pacific (California & Oregon)	3,155,634.16
Oregon & California	2,765,677.10
Atlantic & Pacific (now Santa Fe Pacific)	4,647,749.79
Southern Pacific (main line)	3,875,179.00
Southern Pacific (branch line)	1,559,663.10
Oregon Central	128,618.13
New Orleans Pacific	1,001,783.27
Grand total to corporations	81,193,055.82

WAGON ROADS.	
From Lake Erie to Connecticut Western Reserve	80,773.54
From Lake Michigan to Ohio River	170,580.24
From Fort Wilkins, Copper Harbor, Mich., to Green Bay, Wis	302,930.96
From Fort Wilkins, Copper Harbor, to Wisconsin State line	221,013.35
Oregon Central Military Co. (now California & Oregon Land Co.)	859,094.19
Corvallis and Yaquina Bay	81,895.25
Willamette Valley and Cascade Mountain	861,511.86
Dalles military road	556,827.04
Coos Bay military road	105,240.11
Grand total	3,239,866.54

Withdrawals under the act of March 15, 1910 (36 Stat., 237), from the passage of the act to June 30, 1915.

State.	Applied for.	Rejected before withdrawal.	Withdrawn.	Restored.	Remaining withdrawn.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Arizona	15,030.76		15,030.76		15,030.76
Colorado	1,044,846.19	344,318.56	676,318.29	569,856.73	106,461.56
Idaho	537,501.54	169,769.70	305,973.68	249,279.49	56,694.19
Montana	118,064.07	77,056.57	41,007.50	41,007.50	
Nevada	1,152,566.37	481,023.22	660,438.15	534,928.38	125,509.77
New Mexico	383,951.62	368,090.02	15,861.60	10,000.00	5,861.60
Oregon	446,470.13	208,607.30	236,962.92	161,455.28	75,497.64
Utah	697,917.28	333,954.35	323,057.95	300,672.73	22,385.22
Wyoming	359,050.66	200,525.55	123,423.74	123,423.74	
Total	4,755,398.62	2,183,345.27	2,396,064.59	1,990,623.85	407,390.74

State desert-land segregations under section 4 of the act of Aug. 18, 1894 (28 Stat., 372–422), and the acts amendatory thereof, commonly designated as the Carey Act, with the action taken thereon from the passage of the act to June 30, 1915.

State.	Applied for.	Segregated.	Rejected or relinquished.	Patented.	Reconveyed.	Time to reclaim extended.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Colorado	420,805.33	284,653.97	105,852.32	.....	.....	.....
Idaho	3,236,659.36	1,306,523.80	1,353,196.75	364,841.95	.....	54,115.77
Montana	609,826.46	228,973.84	414,238.56	29,807.08	[1] 10,104.03	62,604.95
Nevada	180,005.85	36,808.59	81,504.08	.....	.....	.....
New Mexico	10,164.68	7,564.68	2,600.00	.....	.....	.....
Oregon	870,657.39	357,878.84	312,284.64	62,718.34	6,014.49	46,304.09
Utah	606,704.00	141,814.94	316,247.57	.....	.....	.....
Washington	155,649.39	.....	155,649.39	.....	.....	.....
Wyoming	1,690,637.72	1,341,226.47	318,353.93	144,116.01	3,977.23	210,757.79
Total	7,781,110.18	3,705,445.13	3,059,927.24	601,573.38	20,095.75	373,762.60

[1] Remains segregated.

Withdrawals for and restorations from power-site and public water reserves under acts of June 25, 1910 (36 Stat., 487), and Aug. 24, 1912 (37 Stat., 497), for fiscal year ended June 30, 1915.

States.	Power-site reserves.		
	Withdrawn.	Restored.	Outstanding June 30, 1915.
Alabama	.....	.....	120
Alaska	68,200	.....	68,200
Arkansas	.....	.....	17,704
Arizona	147,000	.....	337,431
California	33,201	280	255,690
Colorado	.....	.....	270,390
Idaho	5,062	24,868	252,973
Michigan	1,240	.....	1,240
Minnesota	.....	.....	11,020
Montana	510	2,200	155,351
Nebraska	.....	.....	761
Nevada	7,224	.....	26,311
New Mexico	.....	.....	13,577
Oregon	656	4,040	263,326
Utah	2,603	18,160	362,590
Washington	7,507	988	104,056
Wyoming	18,911	5,110	87,365
Total	292,134	55,646	2,228,105

States.	Public water reserves.		
	Withdrawn.	Restored.	Outstanding June 30, 1915.
Arizona	1,918	126	2,992
California	7,030	.....	50,554
Colorado	.....	.....	480
Idaho	5,765	.....	5,765
Montana	1,040	.....	1,040
Nevada	1,464	.....	1,464
New Mexico	.....	.....	1,440
Oregon	.....	.....	2,500
Utah	1,520	240	33,987
Wyoming	520	.....	82,431
Total	19,257	366	182,653

Public and Indian lands entered each year ended June 30, from 1908 to 1915, inclusive.

State or Territory.	1909	1910	1911	1912	1913	1914	1915
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Alabama	50,930.86	47,353.42	49,518.88	90,615.04	56,245.68	39,485.65	25,154.63
Alaska	10,772.33	17,508.03	15,477.69	5,244.95	103.67	3,144.15	22,036.02
Arizona	468,160.64	541,793.23	486,066.86	669,292.97	770,449.59	765,962.11	291,557.70
Arkansas	171,316.50	137,637.76	201,006.00	247,318.58	178,065.19	174,665.29	165,080.01
California	1,290,579.46	1,214,348.36	1,064,644.89	872,301.68	937,230.43	878,874.21	1,001,663.53
Colorado	1,983,078.58	3,994,757.50	2,272,068.99	1,354,326.05	1,458,107.84	1,433,305.88	2,666,068.22
Florida	125,744.65	121,837.68	144,809.48	183,061.64	96,277.34	70,302.88	66,988.42
Idaho	1,383,443.88	1,768,010.34	1,191,012.91	860,840.25	1,030,312.55	947,553.93	1,144,276.80
Illinois							
Indiana	40.00						
Iowa	564.04	160.02					
Kansas	166,375.14	157,311.36	122,810.19	71,915.69	68,775.14	41,651.71	68,190.59
Louisiana	39,428.40	22,344.86	24,432.63	16,491.13	16,309.44	19,781.87	15,618.56
Michigan	33,813.58	19,612.94	17,189.17	17,222.57	13,636.92	16,900.73	14,981.80
Minnesota	385,816.56	295,177.03	239,830.59	397,158.46	191,762.18	323,305.20	298,534.64
Mississippi	35,908.88	29,339.15	34,440.75	27,708.14	20,599.64	19,918.35	18,007.56
Missouri	53,560.91	52,509.66	19,292.74	21,958.53	4,470.06	2,813.91	2,572.69
Montana	2,460,905.55	6,616,734.69	4,659,232.48	3,687,420.90	4,717,117.51	5,386,954.28	4,187,364.36
Nebraska	1,979,872.10	1,638,485.72	1,505,584.66	1,394,388.57	997,812.22	1,037,342.10	372,323.52
Nevada	78,190.07	261,125.24	312,510.88	261,188.07	173,799.66	194,308.33	290,138.53
New Mexico	2,542,799.18	1,924,145.46	1,377,563.07	1,050,399.79	2,324,250.89	1,870,138.66	3,266,995.81
North Dakota	877,649.71	807,512.18	513,357.48	384,218.11	418,685.76	604,264.16	365,719.63
Oklahoma	297,572.30	193,692.95	146,600.50	97,563.31	65,959.39	51,568.38	50,953.86
Oregon	1,091,530.56	1,050,723.53	742,049.87	745,869.45	561,810.14	839,990.89	738,401.77
South Dakota	2,219,560.32	2,946,827.85	1,711,629.43	696,546.70	468,658.33	378,469.32	321,763.13
Utah	619,802.07	577,459.86	693,770.08	549,883.11	262,863.44	189,781.34	373,507.39
Washington	608,546.35	560,789.20	481,459.19	382,565.57	357,323.51	294,930.73	324,884.09
Wisconsin	19,061.18	17,007.33	17,970.36	16,099.44	11,300.18	10,430.11	8,116.32
Wyoming	897,479.96	1,377,063.74	1,167,042.50	503,090.10	665,255.75	927,007.95	760,815.11
Gen. Land Office					40.00		
Total	19,892,503.76	26,391,269.09	19,211,272.27	14,574,688.82	15,867,222.45	16,522,852.12	16,861,214.69

Public lands surveyed and remaining unsurveyed.

State or Territory.	Land area.	Surveyed during fiscal year ending June 30, 1915.	Surveyed to June 30, 1915.	Unsurveyed to June 30, 1915.	Resurveyed during fiscal year ending June 30, 1915.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Alabama	32,818,560		32,818,560		
Alaska	378,165,760	221,177	411,718	377,754,042	
Arizona	72,838,400	2,010,012	25,272,762	47,565,638	76,598
Arkansas	33,616,000	23,149	33,616,000		
California	99,617,280	642,871	79,944,663	19,672,617	126,595
Colorado	66,341,120	78,476	63,349,063	2,992,057	1,149,171
Florida	35,111,040	6,678	30,919,249	4,191,791	
Idaho	53,346,560	1,342,179	31,274,427	22,072,133	134,963
Illinois	35,867,520		35,867,520		
Indiana	23,068,800		23,068,800		
Iowa	35,575,040		35,575,040		
Kansas	52,335,360		52,335,360		
Louisiana	29,061,760		27,181,384	1,880,376	
Michigan	36,787,200	64	36,787,200		
Minnesota	51,749,120	4,948	49,827,895	1,921,225	
Mississippi	29,671,680		29,671,680		
Missouri	43,985,280		43,985,280		
Montana	93,568,640	2,719,075	68,510,463	25,058,177	45,201
Nebraska	49,157,120		49,157,120		165,235
Nevada	70,285,440	1,046,641	41,748,315	28,537,125	1,727
New Mexico	78,401,920	1,607,953	56,840,655	21,561,265	14,397
North Dakota	44,917,120	206,155	42,975,347	1,941,773	
Ohio	26,073,600		26,073,600		
Oklahoma	44,424,960		44,424,960		
Oregon	61,188,480	479,587	51,672,099	9,516,381	5,742
South Dakota	49,195,520	4,573	48,694,173	501,347	
Utah	52,597,760	1,351,245	29,784,558	22,813,202	
Washington	42,775,040	172,838	34,090,420	8,684,620	
Wisconsin	35,363,840	43	35,363,840		
Wyoming	62,460,160	70,723	58,577,041	3,883,119	631,388
Total	1,820,366,080	11,988,387	219,819,192	600,546,888	2,350,962

In Arkansas, Illinois, Iowa, Michigan, and Wisconsin the lands surveyed were not regarded as public land when the surrounding lands were originally surveyed.

Estimated area of existing national forests June 30, 1915.

[Approximately 89 per cent is public.]

	Acres.		Acres.
Alaska	26,748,500	Nevada	5,557,010
Arizona	13,318,690	New Mexico	9,881,660
Arkansas	2,210,800	North Dakota	13,920
California	25,628,995	Oklahoma	61,640
Colorado	14,350,994	Oregon	15,570,694
Florida	674,970	Porto Rico	65,950
Idaho	19,388,905	South Dakota	1,326,172
Kansas	262,787	Utah	7,962,980
Michigan	163,771	Washington	11,660,660
Minnesota	1,570,850	Wyoming	8,633,463
Montana	18,977,425		
Nebraska	209,760	Total area	184,240,596

Area added to national forests during year	26,618
Area excluded from national forests during year	1,107,224
Area embraced in temporary forest withdrawals June 30, 1915	217,900
Area of existing national forests June 30, 1914	185,321,202
Area of existing national forests June 30, 1915	184,240,596
Decrease in area during fiscal year ended June 30, 1915	1,080,606

National monuments.

State and name.	Date.	Area.	State and name.	Date.	Area.
Alaska:		*Acres.*	New Mexico:		*Acres.*
Sitka	Mar. 23, 1910	[1] 57.00	Chaco Canyon	Mar. 11, 1907	20,629.40
Arizona:			El Morro	Dec. 8, 1906	160.00
Grand Canyon [2]	Jan. 11, 1908	[1] 806,400.00	Gila Cliff Dwellings [2]	Nov. 16, 1907	160.00
Montezuma Castle	Dec. 8, 1906	160.00	Gran Quivira	Nov. 1, 1909	[1] 160.00
Navajo	Mar. 14, 1912	[3] 360.00	Oregon:		
Papago Saguaro	Jan. 31, 1914	2,050.43	Oregon Caves [2]	July 12, 1909	[1] 480.00
Petrified Forest	July 31, 1911	[3] 25,625.60	South Dakota:		
Tonto [2]	Dec. 19, 1907	[1] 640.00	Jewel Cave [2]	Feb. 7, 1908	[1] 1,280.00
Tumacacori	Sept. 15, 1908	10.00	Utah:		
California:			Mukuntuweap	July 31, 1909	[1] 15,840.00
Cabrillo	Oct. 14, 1913	.50	Natural Bridges	Sept. 25, 1909	[3] 2,740.00
Cinder Cone [2]	May 6, 1907	[1] 5,120.00	Rainbow Bridge	May 30, 1910	160.00
Devil Postpile [2]	July 6, 1911	[1] 800.00	Washington:		
Lassen Peak [2]	May 6, 1907	[1] 1,280.00	Mount Olympus [2]	May 11, 1915	[1] 299,370.00
Muir Woods	Jan. 9, 1908	295.00	Wyoming:		
Pinnacles	Jan. 16, 1908	[1] 2,080.00	Devils Tower	Sept. 24, 1906	1,152.91
Colorado:			Shoshone Cavern	Sept. 21, 1909	210.00
Colorado [2]	May 24, 1911	13,883.06			1,201,568.90
Wheeler	Dec. 7, 1908	[1] 300.00			
Montana:					
Bighole	June 23, 1910	5.00			
Lewis and Clark Cavern	May 16, 1911	[3] 160.00			

[1] Estimated area.
[2] Under jurisdiction of Department of Agriculture.
[3] According to second proclamation.

List of bird reserves.

Name of reservation.	Date.	Location.	Area.
			Acres.
Pelican Island	Mar. 14, 1903	East Florida coast	5.50
Breton Island	{Oct. 4, 1904 Nov. 11, 1905}	Southeast coast of Louisana	Unknown.
Stump Lake	Mar. 9, 1905	North Dakota	27.39
Huron Islands	Oct. 10, 1905	Lake Superior, Mich	Unknown.
Siskiwit Islands	do	do	Do.
Passage Key	do	Tamapa Bay, Fla	36.57
Indian Key	Feb. 10, 1906	do	90.00
Tern Islands	Aug. 8, 1907	Mouths of Mississippi River, La	Unknown.
Shell Keys	Aug. 17, 1907	South Louisiana coast	Do.
Three Arch Rocks	Oct. 14, 1907	West Oregon coast	Do.
Flattery Rocks	Oct. 23, 1907	West Washington coast	Do.
Quillayute Needles	do	do	Do.
Copalis Rock	do	do	Do.
East Timballer Island	Dec. 7, 1907	South Louisiana coast	Do.
Mosquito Inlet	Feb. 24, 1908	East Florida coast	Do.
Tortugas Keys	Apr. 6, 1908	Florida Keys, Fla	Do.
Klamath Lake	Aug. 8, 1908	Oregon and California	Do.
Key West	do	Florida Keys, Fla	Do.
Lake Malheur	Aug. 18, 1908	Oregon	Do.
Chase Lake	Aug. 28, 1908	North Dakota	Do.
Pine Island	Sept. 15, 1908	West Florida coast	Do.
Matlatcha Pass	Sept. 26, 1908	do	Do.
Palma Sola	do	do	Do.
Island Bay	Oct. 23, 1908	Florida	Do.
Loch Katrine	Oct. 26, 1908	Wyoming	Do.
Hawaiian Islands	Feb. 3, 1909	Hawaii	Do.
East Park	Feb. 25, 1909	California	Do.
Cold Springs	do	Oregon	Do.
Shoshone	do	Wyoming	Do.
Pathfinder	do	do	Do.
Bellefourche	do	South Dakota	Do.
Strawberry Valley	do	Utah	Do.
Salt River	do	Arizona	Do.
Deer Flat	do	Idaho	Do.
Minidoka	do	do	Do.
Willow Creek	do	Montana	Do.
Carlsbad	do	New Mexico	Do.
Rio Grande	do	do	Do.
Keechelus Lake	do	Washington	Do.
Kachess Lake	do	do	Do.
Cle-alum Lake	do	do	Do.
Bumping Lake	do	do	Do.
Conconully	do	do	Do.
Bering Sea	Feb. 27, 1909	Alaska	Do.
Pribilof [1]	do	do	Do.
Tuxedni	do	do	Do.
Farallon	do	California	Do.
Culebra	do	Porto Rico	Do.
Yukon Delta	do	Alaska	Do.
St. Lazaria	do	do	Do.
Bogoslof	Mar. 2, 1909	do	Do.
Clear Lake	Apr. 11, 1911	California	Do.
Forrester Island	Jan. 11, 1912	Alaska	Do.
Hazy Islands	do	do	Do.
Niobrara	do	Nebraska	[2] 14.64
Green Bay	Feb. 21, 1912	Wisconsin	1.87
Chamisso Island	Dec. 7, 1912	Alaska	Unknown.
Pishkun	Dec. 17, 1912	Montana	Do.
Desecheo Island	Dec. 19, 1912	Porto Rico	Do.
Gravel Island	Jan. 9, 1913	Wisconsin	Do.
Aleutian Islands	Mar. 3, 1913	Alaska	Do.
Canal Zone [3]	Mar. 19, 1913	Panama	Do.
Walker Lake	Apr. 21, 1913	Arkansas	Do.
Petit Bois Island	May 6, 1913	Alabama and Mississippi	Do.
Anaho Island	Sept. 4, 1913	Nevada	247.78
Smith Island	June 6, 1914	Washington	Unknown.
Dungeness Spit	Jan. 20, 1915	do	226.02
Edis Hook	do	do	[2] 53.00
Mille Lacs	May 14, 1915	Minnesota	Unknown.
Big Lake	Aug. 6, 1915	Arkansas	Do.

[1] Transferred to Bureau of Fisheries.
[2] Approximate area.
[3] Under jurisdiction of Isthmian Canal Commission. Canal Zone strictly speaking, not a bird reservation, but birds are protected by Executive order.

List of bird reserves—Continued.

Name of reservation.	Date.	Location.	Area.
BIRD RESERVES ENLARGED AND REDUCED.			*Acres.*
Pelican Island	Jan. 26, 1909	Florida (enlarged)	Unknown.
Mosquito Inlet	Apr. 2, 1909	....do	Do.
Cold Springs	Nov. 25, 1911	Oregon (enlarged)	Do.
Clear Lake	Jan. 13, 1912	California (reduced)	Do.
Minidoka	Feb. 21, 1912	Idaho (enlarged)	Do.
Niobrara	Nov. 14, 1912	Nebraska (enlarged)	[1] 15,253.7
Deer Flat	Apr. 21, 1915	Idaho (reduced)	Unknown.
Klamath Lake	May 14, 1915	Oregon and California (reduced)	Do.

[1] Approximate area.

Total reservations, excluding Canal Zone, 69.

Aggregate cash receipts from the disposal of public and Indian lands from May 20, 1785, to June 30, 1915.

Fiscal years.	Cash sales.	Amount of fees and commissions.	Total receipts from disposal of public lands.	Receipts from sales of Indian lands.	Miscellaneous receipts.	Aggregate receipts from all sources.
May 20, 1785, to June 30, 1880.						$208,059,657.14
1881	$3,534,550.98	$860,833.65	$4,395,384.63	$1,006,691.63	$6,727.90	5,408,804.16
1882	6,628,775.92	1,124,531.15	7,753,307.07	634,617.22	6,591.75	8,394,516.04
1883	9,657,032.28	1,423,329.10	11,080,361.38	625,404.27	8,118.05	11,713,883.70
1884	10,304,582.49	1,536,410.58	11,840,993.07	938,137.26	10,274.76	12,789,405.09
1885	6,223,926.74	1,462,188.06	7,686,114.80	933,483.52	8,821.86	8,628,420.18
1886	5,757,891.06	1,654,876.25	7,412,767.31	1,607,729.63	10,587.40	9,031,084.34
1887	9,246,321.33	1,537,600.39	10,783,921.72	1,484,302.30	20,784.85	12,289,008.87
1888	11,203,071.95	1,498,000.05	12,701,072.00	821,113.77	24,951.65	13,547,137.42
1889	8,018,254.50	1,251,971.23	9,270,225.73	389,524.72	26,150.89	9,685,901.34
1890	6,349,174.24	1,121,696.07	7,470,870.31	293,062.30	16,585.00	7,780,517.61
1891	4,160,099.07	944,938.65	5,105,037.72	318,333.42	5,849.00	5,429,220.14
1892	3,322,865.01	1,064,805.26	4,387,670.27	456,681.84	15,757.58	4,860,109.69
1893	3,193,280.64	998,184.65	4,191,465.29	284,752.65	3,516.20	4,479,734.14
1894	1,653,060.71	1,021,205.08	2,674,285.79	91,981.03	1,557.50	2,767,824.32
1895	1,116,090.07	750,710.59	1,866,800.66	149,879.48	16,773.89	2,033,454.03
1896	1,053,905.59	793,557.82	1,847,463.41	214,700.42	44,197.84	2,106,361.67
1897	917,911.19	678,469.55	1,596,380.74	438,716.31	52,834.23	2,087,931.28
1898	1,291,076.10	853,265.50	2,144,341.60	100,317.49	33,336.09	2,277,995.18
1899	1,703,968.32	890,702.17	2,594,690.49	442,913.73	32,533.12	3,070,137.34
1900	2,899,731.83	1,157,081.03	4,056,812.86	239,769.39	83,175.85	4,379,758.10
1901	2,966,542.86	1,340,894.29	4,307,437.15	585,661.27	79,062.37	4,972,160.79
1902	4,139,268.47	1,740,820.18	5,880,088.65	288,666.68	93,171.85	6,261,927.18
1903	8,960,471.18	1,597,147.48	10,557,618.66	308,939.14	158,185.85	11,024,743.65
1904	7,445,902.84	1,349,990.89	8,795,893.73	333,757.62	153,690.63	9,283,341.98
1905	4,849,766.06	1,286,621.93	6,136,387.88	791,807.67	89,615.72	7,017,811.38
1906	4,885,968.82	1,642,488.56	6,528,477.38	967,532.50	89,514.02	7,585,523.90
1907	7,728,114.30	1,819,159.21	9,547,273.51	1,892,805.70	113,098.79	11,553,178.00
1908	9,760,570.19	1,731,883.57	11,492,453.76	997,972.52	225,283.18	12,715,709.46
1909	7,698,337.03	1,536,890.67	9,235,227.70	2,334,885.47	330,136.61	12,216,415.39
1910	6,342,744.75	2,028,892.35	8,371,637.10	2,037,551.68	1,054,735.28	11,463,924.06
1911	5,783,693.39	1,461,514.30	7,196,187.69	2,822,600.71	[1] 1,022,119.20	11,089,927.60
1912	5,437,502.07	1,234,216.47	6,671,718.54	2,284,538.37	[1] 1,016,791.09	9,973,048.00
1913	2,746,546.52	1,540,994.15	4,287,540.67	2,118,469.34	[1] 549,494.80	6,955,504.81
1914	2,650,761.84	1,654,085.02	4,304,846.86	1,844,802.77	[2] 47,677.90	6,148,367.63
1915	1,581,805.48	2,331,368.44	3,913,173.92	1,556,630.97	[2] 28,386.01	5,394,948.20
Total						474,477,393.81

[1] Includes reclamation water-right charges.

[2] Reclamation water-right charges under act of Aug. 9, 1912 (37 Stat., 265) were collected from Jan. 1, 1913, by the Reclamation Service. The sales of reclamation town lots are included in the above column of "Cash sales" for 1915.

Amounts accrued and paid to States for purposes of education, or of making public roads and improvements, on account of grants 2, 3, and 5 per cent of net proceeds of sales of public lands lying within said States.

State.	Total to June 30, 1913.	Fiscal year 1914.	Aggregate to June 30, 1914, inclusive.
Alabama	$1,078,505.96	$448.68	$1,078,954.64
Arizona	7,362.26	3,832.70	11,194.96
Arkansas	325,754.69	543.31	326,298.00
California	1,093,672.80	14,815.79	1,108,488.59
Colorado	470,109.82	7,139.98	477,249.80
Florida	139,952.94	1,831.81	141,784.75
Idaho	249,389.43	6,633.77	256,023.20
Illinois	1,187,908.89		1,187,908.89
Indiana	1,040,255.26		1,040,255.26
Iowa	633,638.10		633,638.10
Kansas	1,126,599.55	415.28	1,127,014.83
Louisiana	468,574.92	154.33	468,729.25
Michigan	587,185.75	209.80	587,395.55
Minnesota	590,095.91	823.25	590,919.16
Mississippi	1,070,023.67	146.15	1,070,169.82
Missouri	1,060,666.21	151.60	1,060,817.81
Montana	428,383.43	25,350.69	453,734.12
Nebraska	559,871.98	3,547.10	563,419.08
Nevada	34,166.89	1,464.30	35,631.19
New Mexico	126,523.36	3,877.20	130,400.56
North Dakota	532,897.37	2,337.17	535,234.54
Ohio	999,353.01		999,353.01
Oklahoma	60,322.10	1,740.21	62,062.31
Oregon	726,088.41	5,836.42	731,924.83
South Dakota	319,916.50	9,861.75	329,778.26
Utah	90,192.58	6,024.73	96,217.31
Washington	398,735.10	6,205.17	404,940.27
Wisconsin	586,442.18	7.69	586,449.87
Wyoming	221,641.76	7,280.33	228,922.09
Total	16,214,230.83	110,679.21	16,324,910.04

Amounts covered into the Treasury to the credit of the reclamation fund from the sales of public lands and fees and commissions in the several States, under the act of June 17, 1902 (32 Stat., 388).

State.	Fiscal years.		Total for 14 years ending June 30, 1914.
	1901 to 1913	1914	
Arizona	$1,140,660.74	$87,479.41	$1,228,140.15
California	5,270,815.02	344,647.76	5,615,462.78
Colorado	6,567,895.79	361,498.69	6,929,394.48
Idaho	4,985,239.21	217,930.32	5,203,169.53
Kansas	956,392.94	14,855.92	971,248.86
Montana	8,569,746.84	1,036,937.89	9,606,684.73
Nebraska	1,645,146.43	110,594.98	1,755,741.41
Nevada	531,130.44	37,753.22	568,883.66
New Mexico	3,911,627.30	192,140.14	4,103,767.44
North Dakota	11,863,005.24	112,231.54	11,975,236.78
Oklahoma	5,773,046.97	38,998.49	5,812,045.46
Oregon	10,355,768.76	184,337.69	10,540,106.45
South Dakota	6,776,158.76	216,564.80	6,992,723.56
Utah	1,797,227.28	133,015.01	1,930,242.29
Washington	6,386,566.63	155,385.30	6,541,951.93
Wyoming	4,310,827.13	214,278.03	4,525,105.16
Total	80,841,255.48	3,458,649.19	84,299,904.67

State grants, fiscal year ended June 30, 1915.

Kind of selection.	Pending and received.			Disposed of.			Pending June 30, 1915.
	Pending July 1, 1914.	Since received.	Total.	Approved.	Canceled.	Total.	
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
School indemnity	2,241,236.31	2,080,992.90	4,322,229.21	16,277.38	48,191.82	64,469.20	4,257,760.01
University	134,790.91	9,802.08	144,592.99	75,429.75	966.06	76,395.81	68,197.18
Agricultural college	43,549.43	14,571.98	58,121.41	5,752.51	160.00	5,912.51	52,208.90
Internal improvements	440.07		440.07	280.00		280.00	160.07
2,000,000-acre grant	40.17	40.00	80.17	40.17	40.00	80.17	
Penitentiaries	68,383.27		68,383.27	22,839.54		22,839.54	45,543.73
Public buildings	96,736.20		96,736.20	69,147.84	440.00	69,587.84	27,148.36
Insane asylums	66,826.48		66,826.48	37,029.48	160.00	37,189.48	29,637.00
Educational, charitable, penal, and reformatory	112,434.21	10,390.45	122,824.66	78,185.31	9,091.15	87,276.46	35,548.20
Deaf and dumb asylums	13,550.02		13,550.02	160.00		160.00	13,390.02
Deaf, dumb, and blind asylums	36,507.89	3,807.02	40,314.91	14,050.16	320.00	14,370.16	25,944.75
Reform schools	160.03		160.03	80.00		80.00	80.03
School of mines	98,186.70	480.00	98,666.70	60,193.55	4,941.93	65,135.48	33,531.22
Normal schools	75,737.89	9,557.67	85,295.56	25,607.30	8,452.47	34,059.77	51,235.79
Reservoirs	793.81		793.81	109.04	40.00	149.04	644.77
Miners' hospitals	93,712.33	1,790.40	95,502.73	50,717.63	5,653.97	56,371.60	39,131.13
Agricultural and mechanical college	63,872.85		63,872.85	26,239.63	7,240.00	33,479.63	30,393.22
Military institute	30,103.56	15,610.01	45,713.57	19,568.42	80.00	19,648.42	26,065.15
Bonds to Grant and Santa Fe Counties	575,358.55	151,214.89	726,573.44	313,466.54	8,168.99	321,635.53	404,937.91
Bonds to Maricopa, etc., counties	53,105.84	22,397.04	75,502.88	41,709.49		41,709.49	33,793.39
Salt springs and contiguous lands		622.56	622.56				622.56
Specific grant total	1,564,290.21	240,284.10	1,804,574.31	840,606.36	45,754.57	886,360.93	918,213.38
Grand total	3,805,526.52	2,321,277.00	6,126,803.52	856,883.74	93,946.39	950,830.13	5,175,973.39

State grants—recapitulation.

State.	Indemnity school land.		Other grants.		
	Pending and selected.	Confirmed.	Pending and selected.	Confirmed.	Canceled.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Arizona			491,982.65	280,558.90	30,755.38
California	311,707.40	5,797.18			
Colorado	46,647.80				
Florida	756.71	756.71			
Idaho	563,105.09		1,125.10		
Louisiana	76.88	76.88			
Minnesota			1,334.88		
Montana	631,972.79		3,257.46	1,480.00	
Nevada			520.24	320.17	40.00
New Mexico	2,154,547.84		1,247,140.44	531,734.93	11,859.61
North Dakota	52,558.84		841.76		200.00
Oklahoma	3,166.71				
Oregon	19,469.28				
South Dakota	269,417.83		40.00	40.00	
Utah	96,148.78	9,646.61	7,493.38	4,589.70	200.00
Washington	42,465.62		293.35		
Wyoming	128,187.64		50,545.06	21,882.66	2,699.58
Total	4,322,229.21	16,277.38	1,804,574.31	840,606.36	45,754.57

Withdrawals under the act of Mar. 15, 1910 (36 Stat., 237), during the fiscal year ended June 30, 1915.

State.	Applied for.	Rejected before withdrawal.	Withdrawn.	Restored.
	Acres.	*Acres.*	*Acres.*	*Acres.*
Arizona	15,030.76		15,030.76	
Colorado	.72	3,084.33	36,041.88	310,977.60
Idaho	115,468.30	115,468.30	3,488.13	9,959.46
Montana				8,031.21
Nevada	16,773.91		100,875.97	245,049.27
New Mexico		354,556.54	5,861.60	
Oregon	43.48	5,121.40	31,742.59	160.00
Utah		332,929.47		128,936.86
Wyoming	2,261.06	44,453.84		49,603.32
Total	149,578.23	855,613.88	193,040.93	752,717.72

State desert-land segregations under section 4 of the act of Aug. 18, 1894 (28 Stat., 372–422), and the acts amendatory thereof, commonly designated as the Carey Act, with the action taken thereon during the fiscal year ended June 30, 1915.

State.	Applied for.	Segregated.	Rejected or relinquished.	Patented.	Time to reclaim extended.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Colorado		12,455.99	26,819.99		
Idaho	759.13	759.13	86,953.84	117,677.24	
Montana			30,643.02	4,244.05	
Oregon	81,637.88		16,083.39	11,135.21	
Utah			48,226.74		
Wyoming	16,267.84		31,230.56	8,462.65	
Total	98,664.85	13,215.12	239,957.54	141,519.15	

Lands certified or patented on account of railroad and wagon road grants during fiscal year ended June 30, 1915.

Grants.	State.	Area.
		Acres.
State grants:		
Flint & Pere Marquette	Michigan	55.35
Florida Central & Peninsular	Florida	9,956.50
South & North Alabama	Alabama	40.04
St. Paul, Minneapolis & Manitoba	Minnesota	1,578.39
Total		11,630.28
Corporations:		
California & Oregon	California	640.00
Central Pacific	do	7,850.08
Western Pacific	do	240.00
Atlantic & Pacific (now Santa Fe Pacific)	Arizona	265,790.63
Do	New Mexico	15,989.12
Northern Pacific	Idaho	134,890.96
Do	Minnesota	1,180.36
Do	Montana	792,721.18
Do	North Dakota	10,528.35
Do	Oregon	27,977.27
Do	Washington	46,217.23
Do	Wisconsin	160.00
Do	Wyoming	2,717.18
Southern Pacific (main line)	California	196,629.17
Southern Pacific (branch line)	do	108,382.02
Total		1,611,913.55
Wagon roads:		
Oregon Central Military Road (now California & Oregon Land Co.).	Oregon	598.44
Total certified or patented during year		1,624,142.27
Cancelled during year		480,649.69
Disposed of during year		2,104,791.96
Received during year		886,215.37

Alleged fraudulent entries acted on during year.

Kind of entry.	Pending June 30, 1914.	Received.	Disposed of.				Pending June 30, 1915.	Hearings.	
			Approved.	Canceled.	Otherwise disposed of.	Total.		General Land Office.	Forest Service.
Homestead:									
Originals	5,407	5,176	.....	957	5,406	6,363	4,220	653	3
Finals	812	2,767	1,912	22	789	2,723	856	36	.....
Cash	217	461	320	3	207	530	148	4	.....
Desert Land:									
Originals	1,279	1,235	.....	70	1,438	1,508	1,006	122	.....
Finals	326	459	119	5	225	349	436	44	.....
Timber culture:									
Originals	5	2	.....	.....	2	2	5	.....	.....
Finals	2	1	.....	.....	1	1	2	.....	.....
Timber and stone:									
Originals	397	286	.....	45	211	256	427	11	.....
Cash	273	157	112	1	150	263	167	4	.....
Isolated tract:									
Original	214	106	.....	15	167	182	138	1	.....
Cash	21	78	8	1	39	48	51	.....	.....
Mineral:									
Application	1,101	602	.....	212	984	1,196	507	30	.....
Finals	198	331	.....	1	314	315	214	18	.....
Soldiers' additional applications	661	559	621	217	.....	838	382	.....	.....
Selections:									
State	1,238	465	.....	.....	880	880	823	9	.....
Forest lieu	375	169	.....	1	391	392	152	20	.....
Railroad	368	46	.....	.....	74	74	340	1	.....
Indian allotments	1,294	164	.....	62	332	394	1,064	95	.....
Squatter claims	57	.....	.....	2	7	9	48	.....	.....
Mineral locations	691	.....	.....	.....	1	1	690	.....	.....
Total	14,936	13,064	3,092	1,614	11,618	16,324	11,676	1,048	3

Field reports on alleged fraudulent entries.

Field:
- Forester—
  - Adverse 200
  - Favorable 1,011
- Agents—
  - Adverse 5,501
  - Favorable 14,798

Indictments, convictions, acquittals and dismissals, fines imposed and paid, and prison sentences, June 30, 1914, to June 30, 1915.

Offenses.	Indictments.	Convictions.	Prison sentences.	Fines imposed.	Fines paid.	Acquittals and dismissals.
Timber trespass	5	12	7	$952	$200	2
Conspiracy	1	0	7	1,500	500	9
Perjury	11	2	2	1,000	.....	5
Inclosures	1	2	.....	750	790	4
Miscellaneous, section 28 Penal Code	4	2	.....	1,000	.....	.....
Intimidation	8	2	2	125	.....	5
Using mails to defraud	13	6	4	.....	.....	3
Section 32 Penal Code	3	2	.....	250	.....	2
Section 29 Penal Code	4	1	1	1,000	.....	3
Section 2011 Penal Code	2	.....	.....	.....	.....	2
Conspiracy to suborn	2	.....	.....	.....	.....	.....
Fraudulent scheme in locating	1	1	.....	.....	.....	.....
Filing fraudulent soldiers' additional D. S.	.....	3	.....	975	.....	.....
Section 5393 Penal Code	.....	.....	.....	.....	.....	3
Setting fire to public range	.....	.....	.....	.....	.....	2
Total	55	33	23	7,552	1,490	40

Class, number, and area of patents issued during fiscal year ended June 30, 1915.

Class.	No.	Area.	Class.	No.	Area.
		Acres.			*Acres.*
Commuted homestead	5,698	806,165.165	Coal	77	10,802.097
Timber and stone	916	93,978.810	Coal deposit	7	(1)
Public sale	2,909	229,347.110	Private-land claim	16	47,789.818
Cash, miscellaneous	387	34,903.305	Small-holding claim	171	3,838.162
Desert land	2,729	448,752.085	Railroad	95	1,632,726.011
Desert-land reclamation	5	520.000	Swamp	9	19,219.630
Desert-land segregation	5	133,336.500	Umatilla Indian lands	48	7,049.620
Town site	6	383.261	Abandoned military reservation	33	4,005.200
Town lot	373	102.370	Choctaw scrip	4	602.900
Homestead	39,276	8,723,703.187	Choctaw lands	10	1,985.410
Alaska homestead	7	1,008.230	Isaac Crow lieu scrip	3	120.000
Forest homestead	209	34,669.950	Sioux half-breed scrip	2	228.420
Indian homestead	3	317.500	Surveyor general's scrip	3	118.100
Reclamation homestead	380	29,108.990	Porterfield scrip	2	80.000
Soldiers' additional homestead	626	32,360.890	Agricultural college scrip (reissue)	1	.....
Military bounty land warrant	41	1,792.250	Cemetery site	2	100.460
Forest lieu selection	242	39,748.570	Mission site	45	554.470
Timber culture	8	1,200.000	Special acts	1,416	348,909.165
Indian	4,023	284,712.330	Supplemental, Apr. 14, 1914	1,175	Not counted.
White Earth Town lot	2	.800			
Mineral	925	51,216.210	Total	61,979	13,025,427.976

[1] Surface area reported elsewhere.

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1915.

Location.	Number of applications, entries, etc. (original and final).	Area.			Receipts for allowed applications and entries.[1]				Total earnings.	Expenses.		
		Entered.		Patented.	Fees and commissions.	Purchase money.	Total.	Indian.		Salaries and commissions registers and receivers.	Incidental.	Total.
		Original.	Final.									
		Acres.	*Acres.*	*Acres.*								
Alabama, Montgomery	663	25,154.63	28,212.75	44,086.660	$4,488.76	$8,401.46	$12,890.22	.....	$10,289.67	$3,702.19	$1,250.98	$4,953.17
Alaska:												
Fairbanks	60	11,892.02	774.41	1,077.204	856.15	2,162.50	3,018.65	.....	11,393.23	620.34	2,400.00	3,020.34
Juneau	110	10,144.00	2,459.18	3,160.997	1,233.83	6,630.30	7,864.13	.....	8,983.65	4,027.58	2,054.37	6,081.95
Nome	58	.....	1,401.28	1,656.490	364.65	3,525.00	3,889.65	.....	4,383.50	470.33	49.15	519.48
Arizona:												
Phoenix	2,630	291,557.70	137,504.86	141,740.521	29,759.61	67,164.16	96,923.77	$75.00	95,492.73	6,000.00	7,399.44	13,399.44
Railroad, Indian, and private land grants	.....	.....	.....	265,870.630	.....	.....	.....	.....	.....	.....	.....	.....
Arkansas:												
Camden	440	20,730.09	14,531.83	25,078.460	3,235.56	3,525.89	6,761.45	.....	6,813.53	2,612.14	1,481.15	4,093.29
Harrison	1,414	61,806.83	63,242.10	75,895.240	9,191.54	5,187.74	14,379.28	.....	13,935.28	5,247.32	2,450.93	7,698.25
Little Rock	1,407	82,543.09	36,365.20	52,570.580	11,090.64	3,663.67	14,754.31	.....	17,508.69	5,721.86	4,189.78	9,911.64
California:												
Eureka	391	23,179.25	11,294.32	11,662.200	3,449.83	16,911.87	20,361.70	262.30	19,759.21	3,191.86	18.78	3,210.64
Independence	635	87,924.81	19,477.85	12,394.896	5,809.35	23,279.60	29,088.95	.....	28,987.45	4,769.42	311.28	5,080.70
Los Angeles	3,028	618,726.57	115,644.19	135,809.322	32,435.60	139,106.94	171,542.54	6,522.06	163,951.80	6,000.00	9,379.69	15,379.69
Sacramento	929	75,527.94	31,213.56	46,738.818	11,445.95	25,030.28	36,476.23	.....	36,115.18	6,000.00	3,809.65	9,809.65
San Francisco	988	84,857.67	30,059.45	39,961.047	10,794.53	26,168.17	36,962.70	1,680.33	39,930.71	6,000.00	2,492.07	8,492.07
Susanville	498	52,940.86	21,411.74	25,628.643	5,106.60	17,360.84	22,467.44	.....	20,044.53	3,990.45	1,372.67	5,363.12
Visalia	647	58,416.24	32,110.02	32,514.940	6,992.69	33,078.55	40,071.24	.....	40,404.92	6,000.00	2,061.18	8,061.18
Railroad, Indian, and private land grants	.....	.....	.....	336,604.890	.....	.....	.....	.....	.....	.....	.....	.....
Colorado:												
Del Norte	293	17,954.68	24,280.34	26,299.490	2,457.08	15,691.97	18,149.05	.....	12,490.28	2,679.21	370.37	3,049.58
Denver	2,330	228,078.33	181,769.29	221,846.383	31,824.49	47,170.84	78,995.33	.....	76,895.89	6,000.00	7,713.27	13,713.27
Durango	314	17,196.96	11,280.15	31,394.807	6,157.70	10,158.52	16,316.22	4,916.00	21,027.99	4,823.82	1,814.45	6,638.27
Glenwood Springs	750	75,567.28	28,915.12	48,445.540	12,840.64	13,293.86	26,134.50	20,147.08	43,618.44	6,000.00	3,547.36	9,547.36
Hugo	1,409	120,164.05	126,545.37	263,014.730	20,902.74	5,107.56	26,010.30	.....	25,992.89	6,000.00	3,571.45	9,571.45
Lamar	4,116	893,095.22	149,846.31	191,069.340	73,666.33	7,700.26	81,366.59	.....	80,696.58	6,000.00	4,581.15	10,581.15
Leadville	130	9,610.86	4,650.07	5,295.636	1,382.05	7,039.25	8,421.30	.....	7,850.35	1,874.68	18.82	1,893.50
Montrose	540	20,297.52	20,642.50	43,645.288	7,676.48	8,735.76	16,412.24	23,267.89	37,530.67	5,894.24	3,339.77	9,234.01
Pueblo	4,169	751,036.61	170,099.55	201,859.905	63,447.01	110,854.02	174,301.03	.....	159,610.81	6,000.00	4,054.27	10,054.27
Sterling	3,179	396,193.39	305,359.92	312,618.770	45,657.28	19,916.56	65,573.84	.....	63,318.93	6,000.00	5,696.47	11,696.47

State grants, fiscal year ended June 30, 1915.

Kind of selection.	Pending and received.			Disposed of.			Pending June 30, 1915.
	Pending July 1, 1914.	Since received.	Total.	Approved.	Canceled.	Total.	
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
School indemnity	2,241,236.31	2,080,992.90	4,322,229.21	16,277.38	48,191.82	64,469.20	4,257,760.01
University	134,790.91	9,802.08	144,592.99	75,429.75	966.06	76,395.81	68,197.18
Agricultural college	43,549.43	14,571.98	58,121.41	5,752.51	160.00	5,912.51	52,208.90
Internal improvements	440.07		440.07	280.00		280.00	160.07
2,000,000-acre grant	40.17	40.00	80.17	40.17	40.00	80.17	
Penitentiaries	68,383.27		68,383.27	22,839.54		22,839.54	45,543.73
Public buildings	96,736.20		96,736.20	69,147.84	440.00	69,587.84	27,148.36
Insane asylums	66,826.48		66,826.48	37,029.48	160.00	37,189.48	29,637.00
Educational, charitable, penal, and reformatory	112,434.21	10,390.45	122,824.66	78,185.31	9,091.15	87,276.46	35,548.20
Deaf and dumb asylums	13,550.02		13,550.02	160.00		160.00	13,390.02
Deaf, dumb, and blind asylums	36,507.89	3,807.02	40,314.91	14,050.16	320.00	14,370.16	25,944.75
Reform schools	160.03		160.03	80.00		80.00	80.03
School of mines	98,186.70	480.00	98,666.70	60,193.55	4,941.93	65,135.48	33,531.22
Normal schools	75,737.89	9,557.67	85,295.56	25,607.30	8,452.47	34,059.77	51,235.79
Reservoirs	793.81		793.81	109.04	40.00	149.04	644.77
Miners' hospitals	93,712.33	1,790.40	95,502.73	50,717.63	5,653.97	56,371.60	39,131.13
Agricultural and mechanical college	63,872.85		63,872.85	26,239.63	7,240.00	33,479.63	30,393.22
Military institute	30,103.56	15,610.01	45,713.57	19,568.42	80.00	19,648.42	26,065.15
Bonds to Grant and Santa Fe Counties	575,358.55	151,214.89	726,573.44	313,466.54	8,168.99	321,635.53	404,937.91
Bonds to Maricopa, etc., counties	53,105.84	22,397.04	75,502.88	41,709.49		41,709.49	33,793.39
Salt springs and contiguous lands		622.56	622.56				622.56
Specific grant total	1,564,290.21	240,284.10	1,804,574.31	840,606.36	45,754.57	886,360.93	918,213.38
Grand total	3,805,526.52	2,321,277.00	6,126,803.52	856,883.74	93,946.39	950,830.13	5,175,973.39

State grants—recapitulation.

State.	Indemnity school land.		Other grants.		
	Pending and selected.	Confirmed.	Pending and selected.	Confirmed.	Canceled.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Arizona			491,982.65	280,558.90	30,755.38
California	311,707.40	5,797.18			
Colorado	46,647.80				
Florida	756.71	756.71			
Idaho	563,105.09		1,125.10		
Louisiana	76.88	76.88			
Minnesota			1,334.88		
Montana	631,972.79		3,257.46	1,480.00	
Nevada			520.24	320.17	40.00
New Mexico	2,154,547.84		1,247,140.44	531,734.93	11,859.61
North Dakota	52,558.84		841.76		200.00
Oklahoma	3,166.71				
Oregon	19,469.28				
South Dakota	269,417.83		40.00	40.00	
Utah	98,148.78	9,646.61	7,493.38	4,589.70	200.00
Washington	42,465.62		293.35		
Wyoming	128,187.64		50,545.05	21,882.66	2,699.58
Total	4,322,229.21	16,277.38	1,804,574.31	840,606.36	45,754.57

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1915—Continued.

Location.	Number of applications, entries, etc. (original and final).	Area.			Receipts for allowed applications and entries.				Total earnings.	Expenses.		
		Entered.		Patented.	Fees and commissions.	Purchase money.	Total.	Indian.		Salaries and commissions registers and receivers.	Incidental.	Total.
		Original.	Final.									
Nebraska:		*Acres.*	*Acres.*	*Acres.*								
Alliance	1,057	82,362.59	319,116.23	471,271.280	$8,150.87	$19,489.06	$27,639.93		$27,643.93	$6,000.00	$3,581.01	$9,581.01
Broken Bow	962	121,461.66	337,167.78	352,732.200	7,945.48	16,841.61	24,787.09		24,782.41	6,000.00	1,705.11	7,705.11
Lincoln	74	2,203.41	12,788.93	7,190.910	515.90	862.28	1,378.18		1,367.33	1,007.23	36.66	1,043.89
North Platte	385	34,292.36	102,924.60	127,808.970	3,585.94	2,611.86	6,197.80		6,576.14	3,516.20	2,441.26	5,957.46
O'Neill	219	13,724.78	58,541.29	71,982.380	2,058.98	2,209.75	4,268.73	$5,442.13	9,718.86	2,569.10	1,521.76	4,090.86
Valentine	872	118,278.72	268,705.53	287,287.090	7,598.84	13,062.58	20,661.42		28,461.42	5,776.56	1,625.26	7,401.82
Railroad, Indian, and private land grants				160.000								
Nevada:												
Carson City	612	221,530.92	22,260.28	23,956.751	7,452.96	29,761.82	37,214.78		33,956.15	6,000.00	1,315.51	7,315.51
Elko	571	68,607.61	22,575.67	20,907.663	7,689.68	24,249.85	31,939.53		31,637.44	6,000.00	2,957.38	8,957.38
New Mexico:												
Clayton	2,850	464,374.71	189,585.49	295,089.918	36,306.77	12,711.98	49,018.75		49,051.81	6,000.00	6,119.19	12,119.19
Fort Sumner	1,237	443,887.48	46,605.16	76,141.180	12,520.63	1,058.13	13,578.76		13,571.76	4,841.67	4,635.63	9,477.30
Las Cruces	2,140	505,925.94	58,254.34	67,581.140	14,242.01	36,427.38	50,669.39		51,902.66	6,000.00	4,677.43	10,677.43
Roswell	3,509	1,148,510.34	112,284.08	142,399.835	35,786.07	10,659.38	46,445.45		43,236.98	6,000.00	5,310.39	11,310.39
Santa Fe	3,045	446,407.08	133,856.52	170,787.876	31,604.78	19,601.57	51,206.35		50,416.66	6,000.00	6,968.67	12,968.67
Tucumcari	1,858	257,890.26	122,133.57	149,605.860	22,179.17	4,931.16	27,110.33		27,083.40	6,000.00	5,761.17	11,761.17
Railroad, Indian, and private land grants				58,430.828								
North Dakota:												
Bismarck	1,034	44,453.37	94,882.74	147,089.510	8,722.99	11,426.30	20,149.29	160.00	20,260.34	5,869.05	4,724.01	10,593.06
Dickinson	2,193	164,830.50	193,904.89	244,221.258	23,078.64	11,097.06	34,175.70		33,848.75	6,000.00	5,138.36	11,138.36
Minot	545	28,351.31	26,788.22	102,688.281	7,390.46	5,217.91	12,608.37	217,699.23	231,196.01	5,725.30	3,572.86	9,298.16
Williston	1,632	117,316.08	119,158.32	148,397.980	13,305.79	10,229.35	23,535.14		23,617.69	6,000.00	5,155.01	11,155.01
Railroad, Indian, and private land grants				37,060.430								
Oklahoma:												
Guthrie	329	11,964.09	24,693.61	43,184.805	2,637.60	18,461.18	21,098.78	84,813.64	99,637.76	3,174.94	3,773.61	6,948.55
Woodward	666	37,103.05	53,752.12	82,064.900	5,137.82	5,307.53	10,445.35		10,650.84	3,999.46	3,180.91	7,180.37
Railroad, Indian, and private land grants				696.430								
Oregon:												
Burns	855	106,193.93	50,305.77	62,332.520	10,422.66	19,443.25	29,865.91		29,794.80	6,000.00	2,113.51	8,113.81
La Grande	1,373	147,781.99	56,996.23	71,296.714	16,307.00	27,603.38	43,910.38	2,773.54	44,895.11	6,000.00	2,711.31	8,711.31
Lakeview	1,098	127,987.26	64,844.75	63,677.240	14,026.22	11,728.92	25,755.14		26,082.81	6,000.00	2,160.81	8,160.51

Portland	464	18,310.53	17,074.94	17,342.514	3,449.62	13,403.15	16,852.77		11,199.62	3,195.86	2,337.79	5,533.65
Roseburg	696	40,576.85	26,079.34	38,173.614	7,706.32	15,829.43	23,535.75		21,936.35	5,894.99	3,703.71	9,598.70
The Dalles	1,713	211,306.02	79,716.18	91,293.190	21,713.62	26,302.91	48,016.53		49,161.62	6,000.00	3,687.83	9,687.83
Vale	615	84,406.16	21,610.06	21,900.280	7,834.53	7,090.10	14,924.63		14,366.99	5,049.32	1,678.31	6,727.63
Railroad, Indian, and private land grants				75,593.400								
South Dakota:												
Bellefourche	996	91,211.85	72,734.30	88,898.979	8,048.53	23,615.01	31,663.54		32,320.12	6,000.00	6,581.76	12,581.76
Gregory	34	3,215.70	2,104.39	80,309.180	5,565.81	1,879.92	7,445.73	216,892.69	224,306.29	5,098.28	4,054.77	9,153.05
Lemmon	1,111	56,531.32	115,260.71	170,552.929	11,415.26	34,156.61	45,571.87	89,753.17	135,218.99	6,000.00	4,748.89	10,748.89
Pierre	406	15,618.85	38,758.05	49,889.970	2,994.57	10,820.92	13,815.49	305.05	13,830.92	3,161.35	2,592.95	5,754.30
Rapid City	1,333	44,994.09	144,532.57	181,547.698	8,507.88	56,492.32	65,000.20		56,679.58	5,541.67	5,673.00	11,214.67
Timber Lake	62	23,127.62	1,465.52	26,150.779	4,436.70	200.00	4,636.70	118,212.60	123,266.85	3,823.34	3,558.70	7,382.04
Railroad, Indian, and private land grants				36,628.550								
Utah:												
Salt Lake City	2,196	357,222.85	89,279.60	69,790.802	32,052.13	110,092.65	142,144.78		76,034.45	6,000.00	5,411.56	11,411.56
Vernal	94	8,285.25	3,152.33	26,999.488	3,222.17	4,689.63	7,911.80	32,574.75	40,105.55	3,474.57	1,312.62	4,787.19
Railroad, Indian, and private land grants				169.590								
Washington:												
North Yakima	330	80,113.81	21,775.16	29,899.241	5,573.23	6,713.44	12,286.67		10,269.24	5,475.40	2,389.28	7,864.68
Olympia [1]	31	833.36	1,340.26	1,570.138	324.32	315.76	640.08		778.18	823.86	328.40	1,152.26
Seattle	201	6,093.31	9,299.14	15,433.938	1,843.82	59,049.89	60,893.71		36,092.31	4,011.30	2,400.51	6,411.81
Spokane	779	42,334.02	52,816.27	72,598.074	10,973.42	24,458.82	35,432.24	3,457.18	40,066.97	6,000.00	2,954.91	8,954.91
Vancouver	258	15,779.11	14,153.98	20,524.260	2,661.32	12,789.79	15,451.11		13,204.25	3,104.23	2,198.76	5,302.99
Walla Walla	451	46,181.89	20,661.77	29,657.910	5,942.10	4,534.28	10,476.38		10,950.01	4,740.74	1,369.74	6,110.48
Waterville	928	94,487.38	54,303.03	88,853.003	11,468.63	17,398.42	28,867.05	4,667.41	32,061.66	6,000.00	3,320.91	9,320.91
Railroad, Indian, and private land grants				95,417.201								
Wisconsin:												
Wausau	333	8,116.32	13,907.01	16,960.680	2,458.00	2,515.87	4,973.87		5,086.77	2,708.18	141.46	2,849.64
Railroad, Indian, and private land grants				160.000								
Wyoming:												
Buffalo	1,043	147,482.21	35,911.28	47,885.052	13,125.94	26,477.41	39,603.35		38,692.98	6,000.00	3,235.31	9,235.31
Cheyenne	1,707	249,054.27	125,770.24	138,840.215	24,735.20	32,786.26	57,521.46		59,245.09	6,000.00	3,857.01	9,857.01
Douglas	977	107,511.90	70,938.35	103,094.230	11,154.54	23,691.02	34,845.56		36,825.56	6,000.00	2,215.76	8,215.76
Evanston	658	66,476.83	30,337.37	31,156.525	6,940.02	111,477.66	118,417.68		120,077.28	6,000.00	1,261.76	7,261.76
Lander	508	48,892.80	17,890.18	26,000.535	6,074.35	6,721.88	12,796.23	1,869.12	26,503.80	5,067.22	1,281.76	6,348.98
Sundance	1,216	138,508.71	127,824.31	143,361.252	15,472.62	19,425.18	34,897.80		33,432.13	6,000.00	2,372.43	8,372.43
Railroad, Indian, and private land grants				33,929.660								
Made at General Land Office	4		56.26	35,413.390	8.00	100.00	108.00		47,204.90			
Collections at Surveyors' General Offices									4,900.79			
Total	124,391	16,188,071.66	8,323,627.87	13,025,427.976	1,581,805.48	2,331,368.44	3,913,173.92	1,556,630.97	5,394,948.20	490,597.70	338,268.01	828,865.71

[1] Business for seven months only. Office closed January 30, 1915. Consolidated with Seattle.

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1915—Continued.

RECAPITULATION BY STATES.

Location.	Number of applications, entries, etc. (original and final).	Area.			Receipts for allowed applications and entries.				Total earnings.	Expenses.		
		Entered.		Patented.	Fees and commissions.	Purchase money.	Total.	Indian.		Salaries and commissions registers and receivers.	Incidental.	Total.
		Original.	Final.									
		Acres.	*Acres.*	*Acres.*								
Alabama	663	25,154.63	28,212.75	44,066.660	$4,488.76	$8,401.46	$12,890.22	.....	$10,289.67	$3,702.19	$1,250.98	$4,953.17
Alaska	228	22,036.02	4,634.87	5,894.691	2,454.63	12,317.80	14,772.43	.....	24,750.38	5,118.25	4,503.52	9,621.77
Arizona	2,630	291,557.70	137,504.86	407,611.510	29,759.61	67,164.16	96,923.77	$75.00	95,492.73	6,000.00	7,399.44	13,399.44
Arkansas	3,261	165,080.01	114,139.13	153,544.280	23,517.74	12,377.30	35,895.04	.....	33,257.50	13,581.32	8,121.86	21,703.18
California	7,117	1,001,573.34	261,211.13	641,314.756	76,034.55	280,936.25	356,970.80	8,464.69	349,193.80	35,951.73	19,445.32	55,397.05
Colorado	17,230	2,529,196.90	1,023,388.62	1,345,489.789	266,011.80	245,668.60	511,680.40	48,330.97	529,032.83	51,271.95	34,707.38	85,979.33
Florida	1,079	66,988.42	44,298.02	54,873.650	9,434.67	20,406.93	29,841.60	.....	29,412.17	5,807.87	3,982.02	9,789.89
Idaho	10,059	1,137,915.11	479,854.19	730,206.321	116,227.75	151,297.82	267,525.57	26,933.42	304,754.04	29,499.61	20,651.44	50,151.05
Illinois	.....	.....	.....	40.000	.....	.....	.....	.....	.....	.....	.....	.....
Iowa	.....	.....	.....	242.430	.....	.....	.....	.....	.....	.....	.....	.....
Kansas	976	68,190.59	71,791.85	96,424.970	8,885.50	11,400.71	20,286.21	9,111.77	29,499.97	7,282.37	3,822.12	11,104.49
Louisiana	416	15,618.56	18,995.54	44,579.610	4,031.71	5,315.30	9,347.01	.....	9,579.76	3,845.20	4,172.67	8,017.87
Michigan	324	14,981.80	10,608.63	12,359.710	3,098.06	6,898.19	9,996.25	.....	9,538.84	2,964.44	75.77	3,040.21
Minnesota	1,069	41,646.44	46,059.65	227,864.320	40,644.82	18,823.24	59,468.06	226,868.21	280,852.74	15,698.46	9,924.71	25,623.17
Mississippi	465	18,007.56	12,216.15	18,091.945	3,791.74	3,305.57	7,097.31	.....	7,148.53	3,319.24	3,018.34	6,337.58
Missouri	199	2,572.69	11,168.49	16,315.095	947.73	3,448.30	4,396.03	.....	4,395.53	1,306.20	1,218.27	2,524.47
Montana	30,395	4,065,439.44	2,358,665.27	3,994,418.382	458,106.50	515,585.19	973,691.69	458,226.40	1,439,542.40	57,599.05	60,117.46	117,716.51
Nebraska	3,569	372,323.52	1,099,244.36	1,318,432.830	29,856.01	55,077.14	84,933.15	5,442.13	98,550.09	24,869.09	10,911.06	35,780.15
Nevada	1,183	290,138.53	44,835.95	44,864.414	15,142.64	54,011.67	69,154.31	.....	65,593.59	12,000.00	4,272.89	16,272.89
New Mexico	14,639	3,266,995.81	662,719.16	960,036.637	152,639.43	85,389.60	238,029.03	.....	235,263.27	34,841.67	33,472.48	68,314.15
North Dakota	5,404	354,951.26	434,734.17	679,457.459	52,497.88	37,970.62	90,468.50	217,859.23	308,922.79	23,594.35	18,590.24	42,184.59
Oklahoma	995	49,067.14	78,445.73	125,946.135	7,775.42	23,768.71	31,544.13	84,813.64	110,288.60	7,174.40	6,954.52	14,128.92
Oregon	6,814	736,562.74	316,627.27	441,609.472	81,459.97	121,401.14	202,861.11	2,773.54	197,437.30	38,140.17	18,363.27	56,533.44
South Dakota	3,942	234,699.43	374,855.54	633,978.085	40,968.75	127,164.78	168,133.53	425,163.51	585,624.75	29,624.64	27,210.07	56,834.71
Utah	2,290	365,508.10	92,431.93	96,959.880	35,274.30	114,782.28	150,056.58	32,574.75	116,140.00	9,474.57	6,724.18	16,198.75
Washington	2,978	285,822.88	174,349.61	353,983.765	38,796.84	125,260.40	164,047.24	8,124.59	143,417.62	30,155.53	14,962.51	45,118.04
Wisconsin	333	8,116.32	13,907.01	17,120.680	2,458.00	2,515.87	4,973.87	.....	5,066.77	2,708.18	141.46	2,849.64
Wyoming	6,109	757,926.72	408,671.73	524,267.469	77,502.67	220,579.41	298,082.08	1,869.12	314,776.84	35,067.22	14,224.03	49,291.25
Made at General Land Office	4	.....	56.26	35,413.390	8.00	100.00	108.00	.....	.....	.....	.....	.....
Total	124,391	16,188,071.66	8,323,627.87	13,025,427.976	1,581,805.48	2,331,368.44	3,913,173.92	1,556,630.97	5,342,842.51	490,597.70	338,268.01	828,865.71

Sales of public lands, General Land Office										108.00				
Depredations										31,203.54				
Depredations, Crow										88.33				
Miscellaneous receipts (leases, power sites, etc., act of Feb. 15, 1901)										1,116.21				
Copies of records, plats, etc., made at General Land Office										14,738.82				
Copies of records, plats, etc., made at 13 surveyor generals' offices										4,900.79				
Aggregate	124,391	16,188,071.66	8,323,627.87	13,025,427.976	1,581,805.48	2,331,368.44	3,913,173.92	1,556,630.97	5,394,948.20	490,597.70	338,268.01	828,865.71		

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1915—Continued.

RECAPITULATION BY CLASSES OF ENTRIES.

State or Territory.	At public auction.			Subject to preemption entry.			Timber and stone.			Mineral.			Coal.		
	Entries.	Acres.	Amount.	Entries.	Acres.	Amount.	Entries.	Acres.	Amount.	Entries.	Acres.	Amount.	Entries.	Acres.	Amount.
Alabama							26	1,566.05	$6,155.73						
Alaska										55	3,087.59	$10,227.50	1	154.18	$1,571.77
Arizona	7	560.11	$1,190.28							83	6,077.87	30,210.00			
Arkansas	16	604.72	1,321.09				20	964.92	3,300.62	3	100.00	250.00			
California	182	10,423.51	22,296.36				131	14,112.67	43,559.20	92	14,064.13	48,930.00			
Colorado	237	20,997.48	43,570.62				48	5,322.11	15,783.64	115	5,592.35	19,285.00	3	763.71	70,035.90
Florida	7	528.94	1,653.05				7	464.33	1,436.00						
Idaho	139	11,748.16	30,694.26				50	5,391.78	17,482.70	57	3,007.78	13,102.50			
Kansas	40	2,602.65	5,879.08												
Louisiana							7	618.52	2,050.12						
Michigan							31	2,090.47	5,983.10						
Minnesota	9	153.44	1,254.80				44	4,769.04	12,369.97						
Mississippi	1	158.75	426.57				2	80.03	217.93						
Montana	686	55,074.40	162,676.40	7	740.00	$1,650.00	51	5,429.59	18,221.68	179	6,879.77	28,637.50	10	470.06	9,601.60
Nebraska	170	16,102.87	49,051.33												
Nevada	16	1,311.97	2,448.79							74	5,557.13	28,255.00			
New Mexico	124	8,808.36	17,346.69							43	1,554.18	7,825.00	6	695.32	17,689.25
North Dakota	130	6,842.48	28,515.04										1	40.00	800.00
Oklahoma	30	1,536.09	2,999.88												
Oregon	234	22,634.89	47,818.42				97	9,887.28	30,287.79	19	691.22	2,800.00	1	43.00	860.00
South Dakota	262	22,210.38	53,620.35				6	411.95	1,342.03	12	1,003.44	4,970.00	1	40.00	400.00
Utah	20	1,418.33	4,296.20				3	440.00	1,100.00	63	5,051.49	17,917.50	8	1,261.49	71,214.90
Washington	61	4,246.76	10,717.02				86	9,970.64	32,105.24	23	1,142.63	5,025.00	9	2,408.05	53,457.10
Wisconsin	1	.24	2.40				8	270.30	899.70						
Wyoming	218	21,868.41	53,061.33				33	3,964.11	10,277.24	7	691.17	2,117.50	7	894.01	94,886.30
Made at General Land Office	2	5.08	100.00												
Total	2,592	209,838.02	540,071.96	7	740.00	1,650.00	650	65,753.79	202,572.69	825	54,500.75	219,552.50	47	6,769.82	320,516.82

State or Territory.	Sale of abandoned military reservations.			Excess payments on homestead and other.			Desert land entries.					
							Entries (number).		Acres.		Amount.	
	Entries.	Acres.	Amount.	Entries.	Acres.	Amount.	Original.	Final.	Original.	Final.	Original.	Final.
Alabama				9	31.84	$39.92						
Arizona	13	1,730.43	$1,937.08	45	170.15	226.96	133	60	25,835.86	10,358.12	$6,458.54	$10,359.55
Arkansas				67	251.86	318.57						
California				266	929.51	1,473.17	992	435	189,115.33	76,841.73	47,871.76	76,614.66
Colorado				1,391	4,551.78	7,377.86	202	333	31,428.80	60,549.30	7,813.27	60,549.20
Florida				39	100.12	125.35						
Idaho				381	2,006.61	2,463.34	329	295	52,474.13	41,508.08	13,121.73	41,525.72
Kansas				17	76.77	104.56						
Louisiana				22	51.83	69.50						
Michigan				4	12.22	15.09						
Minnesota				24	117.19	185.21						
Mississippi				22	96.76	118.68						
Missouri				1	3.24	4.05						
Montana	4	425.80	522.25	1,034	5,469.72	8,212.90	236	504	37,460.03	89,225.68	9,382.35	89,240.32
Nebraska	1	114.63	74.31	54	373.83	467.30						
Nevada				26	257.89	386.59	157	68	30,250.27	11,638.27	7,562.72	11,638.28
New Mexico	1	120.00	150.00	370	1,513.42	1,919.15	117	78	17,654.42	13,695.71	4,413.30	13,692.30
North Dakota				76	405.51	662.06		2		640.00		640.00
Oklahoma				9	29.25	36.79						
Oregon				266	1,276.17	1,658.86	75	72	12,125.84	10,078.60	3,025.14	10,066.92
South Dakota				42	167.87	166.84	20	88	2,635.96	13,036.49	658.97	13,036.64
Utah	1	120.00	150.00	110	546.53	697.51	133	108	17,538.53	14,502.42	4,385.37	14,503.19
Washington	1	1.20	3.00	66	303.87	472.21	118	36	17,244.35	4,422.05	4,311.49	4,422.10
Wisconsin				2	35.26	54.30						
Wyoming	3	399.63	684.10	283	1,260.30	1,595.53	169	248	26,260.25	40,545.90	6,591.42	40,547.19
Total	24	2,911.69	3,520.74	4,626	20,039.50	28,852.30	2,681	2,327	460,023.77	386,742.35	115,096.06	386,836.07

Entries made and expenses encurred at district land offices during fiscal year ended June 30, 1915—Continued.

RECAPITULATION, BY CLASSES OF ENTRIES.

State or Territory.	Homestead entries.								
	Entries.			Acres.			Amount.		
	Original.	Final.	Commuted.	Original.	Final.	Commuted.	Original.	Final.	Commuted.
Alabama	318	259	23	25,122.79	24,100.68	1,325.23	$2,517.90	$617.50	$1,657.55
Alaska	81	14	2	20,536.02	1,143.65	144.25	1,531.97	137.91	180.33
Arizona	1,409	709	89	240,107.50	105,511.13	13,027.20	22,321.04	4,666.92	16,631.75
Arkansas	1,944	1,111	61	164,828.15	106,724.48	5,505.01	17,400.91	2,680.77	6,887.02
California	3,559	927	195	498,477.92	117,581.69	27,887.40	55,585.35	6,567.43	40,264.10
Colorado	9,899	4,383	97	2,489,974.51	914,289.64	14,598.88	197,324.47	41,772.29	19,609.11
Florida	651	257	107	66,833.52	29,975.99	13,287.07	6,617.95	771.32	16,588.70
Idaho	5,653	2,777	154	1,006,423.15	397,739.51	29,209.07	90,073.31	15,721.97	25,375.91
Kansas	454	431	28	68,113.82	65,057.30	4,011.90	5,890.12	1,960.11	5,267.07
Louisiana	198	130	28	15,566.73	8,839.67	2,082.03	1,797.00	270.40	2,613.90
Michigan	167	77	5	14,969.58	7,798.09	600.00	1,553.36	215.08	800.00
Minnesota	502	407	39	38,084.47	38,139.66	2,877.51	4,413.38	1,240.42	4,286.60
Mississippi	247	153	22	17,910.80	9,847.26	1,900.84	1,983.83	258.46	2,355.80
Missouri	35	112	.....	2,569.45	8,614.02	.....	279.05	229.32	.....
Montana	16,146	9,738	906	3,500,268.31	2,058,996.67	139,138.38	316,574.31	95,317.62	181,026.49
Nebraska	1,120	2,190	27	371,949.69	1,078,159.81	2,933.55	14,909.00	8,742.43	3,767.33
Nevada	557	193	16	96,915.25	23,619.90	2,378.94	9,941.96	1,730.55	3,159.96
New Mexico	6,113	3,393	108	1,358,053.88	610,809.38	16,488.46	110,385.10	23,381.33	20,612.96
North Dakota	2,071	3,020	44	326,862.62	422,532.63	4,679.06	28,194.35	15,877.55	7,353.52
Oklahoma	376	523	46	45,871.18	69,866.70	5,135.14	4,263.68	1,746.16	7,530.04
Oregon	3,878	1,654	106	714,606.19	258,528.93	14,376.92	63,556.31	10,581.38	19,132.76
South Dakota	1,100	1,750	459	154,797.57	268,044.44	70,108.84	13,913.15	6,746.53	50,328.05
Utah	1,447	304	4	332,481.20	69,224.11	414.09	27,372.06	3,390.20	517.61
Washington	1,259	1,029	73	180,692.10	141,938.87	9,803.15	20,026.80	7,734.81	14,747.24
Wisconsin	146	148	15	8,081.06	12,228.79	1,087.68	1,117.27	467.35	1,559.47
Wyoming	3,030	1,652	40	679,677.16	331,617.44	5,923.82	56,035.45	14,086.45	7,569.75
Made at General Land Office	.....	2	.....	.....	51.18	.....	.....	8.00	.....
Total	62,360	37,343	2,694	12,439,774.62	7,180,981.62	379,923.42	1,075,579.08	266,920.26	459,923.02

State or Territory.	Applications.						Mineral adverse claims.		Filings.								Fees.		Miscellaneous entries, applications, sales, etc.[1]		
	Coal lands.		Timber and stone lands.		Mineral lands.				Preemption.		Homesteads.		Coal lands.		Reservoir.		Cancellation.	Received for reducing testimony to writing, etc.			
	No.	Fees.	No.	Fees.	No.	Fees.	No.	Fees.	No.	Fees.	No.	Fees.	No.	Fees.	No.	Fees.			No.	Acres.	Amount.
Alabama			22	$220													$14	$1,119.36	6	1,220.79	$548.26
Alaska					53	$530	8	$80										174.75	14	1,605.20	338.20
Arizona			3	30	55	550	3	30			2	$6			7	$21	86	1,823.47	12	25,684.19	328.00
Arkansas			33	330	1	10					3	6					58	3,032.06	2	240.00	300.00
California			158	1,580	100	1,000	6	60			12	36			3	7	242	6,821.67	59	313,650.58	4,560.10
Colorado			60	600	92	920	7	70	253	$759	58	174	42	$126	1	3	1,060	11,908.20	9	4,514.96	12,879.87
Florida			4	40							2	4					41	1,956.40	5	96.47	577.83
Idaho			68	680	48	480	4	40			16	48	2	6			238	6,644.64	86	77,261.03	9,827.49
Kansas											4	8					69	958.27	2	120.00	150.00
Louisiana			11	110													6	1,848.31	20	7,455.32	581.78
Michigan			38	380													4	944.62	2	120.07	101.00
Minnesota			49	490							2	4					233	3,227.71	13	3,564.78	31,762.97
Mississippi			15	150													10	1,389.45	3	229.27	186.59
Missouri																	5	434.36	51	2,554.47	3,440.25
Montana	1	$10	94	940	142	1,420	5	50	9	27	57	171	41	123	19	57	1,056	22,528.39	526	524,526.33	26,394.73
Nebraska			2	20							1	2					151	6,025.84	4	1,933.50	1,722.61
Nevada					57	570	2	20					7	21			18	806.93	10	163.044.86	2,594.33
New Mexico					50	500	1	10			3	9	4	12	30	90	431	5,805.50	4,198	1,900,323.81	13,765.95
North Dakota	1	10									3	6	2	4			199	5,547.03	54	27,683.13	2,659.95
Oklahoma											1	2					74	1,484.15	10	5,074.51	14,207.43
Oregon	2	20	150	1,500	19	190					10	30	5	15			247	5,090.28	226	8,941.97	5,974.25
South Dakota			10	100	6	60					7	14	6	12	4	8	292	7,574.61	169	77,098.03	14,890.36
Utah	7	70	1	10	31	310	2	20			2	6	12	36			123	2,029.31	34	14,941.84	1,863.73
Washington	4	40	129	1,290	17	170					7	21	10	30			120	3,912.59	50	87,998.82	5,441.64
Wisconsin			11	110													3	763.38	2	320.00	
Wyoming	1	10	61	610	10	100	14	140			13	39	32	96	5	15	145	4,782.92	283	53,496.25	4,691.90
Total	16	160	919	9,190	681	6,810	52	520	262	786	203	586	163	481	69	201	4,925	108,634.20	5,850	3,303,700.18	159,789.22

[1] This table includes State and railroad selections. Particulars will be found on another page.

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915.

[Counties containing no unappropriated lands are omitted.]

ALABAMA.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Montgomery:				
Barbour	320		320	Broken, sandy.
Baldwin	2,900		2,900	Marshy, level, sandy.
Blount	200		200	Mountainous, rolling.
Butler	200		200	Pine, rolling, sandy.
Calhoun	400		400	Do.
Cherokee	2,480		2,480	Mountainous, broken.
Chilton	200		200	Pine, sandy.
Choctaw	1,000		1,000	Timbered, sandy.
Clark	240		240	Pine, agricultural.
Clay	2,540		2,540	Mountainous, hilly, broken.
Cleburne	3,200		3,200	Do.
Colbert	160		160	Do.
Conecuh	520		520	Pine, broken, sandy.
Coosa	840		840	Rolling, sandy.
Covington	320		320	Level, sandy.
Crenshaw	120		120	Hilly, broken, rolling.
Cullman	440		440	Mountainous, broken.
Dale	320		320	Pine, level, sandy.
Dekalb	340		340	Mountainous, broken, rolling.
Elmore	80		80	Pine, varied soil.
Escambia	560		560	Pine, light, sandy.
Etowah	120		120	Mountainous, broken.
Fayette	640		640	Do.
Franklin	880		880	Do.
Greene	120		120	Hilly, broken.
Geneva	80		80	Pine, sandy.
Houston	200		200	Hilly, broken, sandy.
Hale	200		200	Do.
Jackson	3,600		3,600	Mountainous, broken.
Lamar	760		760	Do.
Lauderdale	5,000		5,000	Do.
Lawrence	520		520	Broken, soil varied.
Marion	1,680		1,680	Do.
Madison	5,040		5,040	Broken, hilly, sandy.
Marshall	1,000		1,000	Do.
Mobile	400		400	Do.
Monroe	320		320	Do.
Morgan	1,200		1,200	Broken, hilly.
Perry	80		80	Hilly, pine.
Pickens	480		480	Rolling, pine.
Pike	280		280	Do.
St. Clair	360		360	Hilly, mountainous.
Shelby	320		320	Hilly, rolling, broken.
Sumter	400		400	Sandy, rolling.
Talladega	1,000		1,000	Mountainous, broken, hilly.
Tallapoosea	80		80	Hilly, red, varied soil.
Tuscaloosa	1,240		1,240	Hilly, broken, rolling.
Walker	200		200	Do.
Washington	1,400		1,400	Pine, sandy, rolling.
Wilcox	160		160	Do.
Winsten	2,800		2,800	Mountainous, broken.
State total	47,940		47,940	

ARIZONA.

Phoenix:				
Apache	962,680	490,828	1,453,508	Mountainous, arid, grazing, timber.
Cochise	1,338,736	376,950	1,715,686	Mountainous, grazing.
Coconino	764,758	1,968,021	2,732,779	Mountainous, grazing, timber.
Gila	285,508	1,056,542	1,342,050	Arid, broken.
Graham	678,456	1,103,787	1,782,243	Mountainous, grazing, arid.
Greenlee	79,400	84,300	163,700	Do.
Maricopa	639,381	3,216,291	3,855,672	Arid, grazing, broken.
Mohave	1,853,960	5,814,540	7,668,500	Do.
Navajo	1,108,985	370,067	1,479,052	Do.
Pima	1,011,458	3,314,815	4,326,273	Mountainous, arid, grazing.
Pinal	32,440	1,778,236	1,810,676	Arid, grazing.
Santa Cruz	174,093	17,433	191,526	Mountainous, arid, grazing.
Yavapai	1,160,635	1,749,451	2,910,086	Mountainous, timber, grazing.
Yuma	596,298	4,782,278	5,378,576	Arid, grazing, broken.
State total	10,686,788	26,123,539	36,810,327	

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

ARKANSAS.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Camden:				
Ashley	83		83	Rolling; second-rate soil.
Bradley	207		207	Swampy.
Calhoun	559		559	Do.
Clark	243		243	Broken.
Cleveland	54		54	River and creek bottom land.
Columbia	109		109	Rolling.
Drew	42		42	Do.
Garland	5,204		5,204	Mountainous.
Hempstead	42		42	Level; second-rate soil.
Hot Spring	2,591		2,591	Mountainous.
Howard	3,036		3,036	Do.
Lafayette	284		284	Level, rather low; second-rate soil.
Little River	75		75	Part on river, part rolling.
Miller	99		99	Low and wet.
Montgomery	8,022		8,022	Mountainous.
Nevada	249		249	Rolling.
Ouachita	5	40	45	River land.
Pike	2,053		2,053	Mountainous.
Polk	6,976		6,976	Do.
Saline	564		564	Do.
Sevier	1,590		1,590	Do.
Union	133		133	Flat, swampy.
Total	32,220	40	32,260	
Harrison:				
Baxter	17,119		17,119	Mountainous.
Benton	2,100		2,100	Do.
Boone	3,340		3,340	Do.
Carroll	4,200		4,200	Do.
Crawford	360		360	Do.
Franklin	1,770		1,770	Do.
Fulton	10,945		10,945	Do.
Independence	720		720	Do.
Izard	16,100		16,100	Do.
Johnson	640		640	Do.
Madison	7,720		7,720	Do.
Marion	9,982		9,982	Do.
Newton	11,370		11,370	Do.
Searcy	8,123		8,123	Do.
Stone	10,955		10,955	Do.
Van Buren	560		560	Do.
Washington	9,000		9,600	Do.
Total	115,604		115,604	
Little Rock:				
Arkansas	40		40	Broken, timbered.
Ashley	240		240	Swampy.
Clay	40		40	Broken, timbered.
Cleburne	3,560		3,560	Mountainous, timbered.
Cleveland	167		167	Broken, timbered.
Conway	1,720		1,720	Mountainous, timbered.
Craighead	10,222		10,222	Swampy, timbered.
Crawford	5,480		5,480	Mountainous, timbered
Desha	40		40	Swampy, timbered.
Faulkner	840		840	Broken, timbered.
Franklin	3,960		3,960	Do.
Fulton	6,400		6,400	Do.
Garland	80		80	Do.
Greene	8,376		8,376	Swampy, timbered.
Hot Spring	200		200	Broken, timbered.
Independence	4,040		4,040	Do.
Izard	4,560		4,560	Do.
Jackson	40		40	Do.
Johnson	7,840		7,840	Do.
Lawrence	440		440	Do.
Lincoln	40		40	Level, timbered.
Logan	8,560		8,560	Broken, timbered.
Lonoke	40		40	Level, timbered.
Mississippi	97	20,000	20,097	Swampy, timbered.
Monroe	40		40	Do.
Montgomery	440		440	Broken, timbered.
Perry	440		440	Do.

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

ARKANSAS—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Little Rock—Continued.				
Poinsett	709		709	Swampy, timbered.
Pope	1,360		1,360	Broken, timbered.
Pulaski	200		200	Do.
Randolph	4,840		4,840	Do.
Saline	1,240		1,240	Do.
Scott	6,480		6,480	Do.
Sebastian	2,920		2,920	Do.
Sharp	13,120		13,120	Do.
Van Buren	6,160		6,160	Do.
White	560		560	Do.
Yell	4,760		4,760	Do.
Total	110,291	20,000	130,291	
State total	258,115	20,040	278,155	

CALIFORNIA.

Eureka:				
Del Norte	831		831	Sea beach, mountainous, waste.
Humboldt	89,484	18,623	108,107	Mountainous, grazing, farming, timber, mineral.
Mendocino	8,600		8,600	Mountainous, grazing, timber.
Trinity	13,040	2,560	15,600	Mountainous, grazing, mining, timber.
Siskiyou	933		933	Forest listings.
Total	112,888	21,183	134,071	
Independence:				
Alpine	10,581		10,581	Mountainous, grazing, and mineral.
Inyo	2,627,160	1,205,823	3,832,983	Agricultural, mountainous, desert.
Kern	621,397	98,041	719,438	Grazing and mineral.
Mono	281,458	40,573	322,031	Grazing, mineral, agricultural.
San Bernardino	2,253,034	1,106,077	3,359,111	Mountainous, mineral, arid.
Total	5,793,630	2,450,514	8,244,144	
Los Angeles:				
Imperial	720,991	212,560	933,551	Level desert.
Kern	43,277	14,347	57,624	Arid, level desert, mountainous.
Los Angeles	562,788	138,932	701,720	Do.
Orange	20,101	1,906	22,007	Mountainous, hilly.
Riverside	1,422,315	417,855	1,840,170	Mountainous, rolling, level desert.
Santa Barbara	41,478	6,176	47,654	Mountainous, rolling.
San Bernardino	3,195,792	416,766	3,612,558	Mountainous, rolling, level desert.
San Diego	174,345	333,799	508,144	Do.
Ventura	45,853	53,018	98,871	Mountainous, rolling.
Total	6,226,940	1,595,359	7,822,299	
Sacramento:				
Alpine	18,760		18,760	Mountainous.
Amador	13,658		13,658	Hilly, grazing, mineral, farming.
Butte	26,790		26,790	Do.
Calaveras	66,556		66,556	Do.
Colusa	23,174	1,280	24,454	Do.
El Dorado	39,088		39,088	Do.
Fresno	21,193	2,560	23,753	Do.
Glenn	15,044		15,044	Do.
Lake	9,720		9,720	Mountainous.
Madera	24,345		24,345	Hilly, grazing, farming, mineral.
Mariposa	85,642		85,642	Do.
Merced	14,962		14,962	Do.
Modoc	29,892	6,080	35,972	Mountainous, grazing, timber.
Napa	26,901		26,901	Do.
Nevada	43,661		43,661	Mineral, hilly, grazing, farming.
Placer	24,805		24,805	Hilly, grazing, mineral.
Stanislaus	19,935		19,935	Do.
Shasta	2,204,151	2,160	206,311	Farming, grazing, timber, mineral.
Siskiyou	168,595	47,232	215,827	Do.

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

CALIFORNIA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Sacramento—Continued.				
Tuolumne	34,600	1,600	36,200	Mineral, grazing, timber.
Tehama	141,700	720	142,420	Hilly, grazing, mineral.
Trinity	24,314	4,960	29,274	Mountainous, grazing, mineral, timber.
Yolo	39,216	.....	39,216	Hilly, grazing.
Yuba	26,102	.....	26,102	Hilly, grazing, mineral.
Total	1,142,804	66,592	1,209,396	
San Francisco:				
Alameda	1,120	1,519	2,639	Mountainous.
Colusa	18,980	.....	18,980	Do.
Contra Costa	1,239	.....	1,239	Do.
Fresno	45,779	3,862	49,641	Do.
Glenn	1,920	.....	1,920	Do.
Kern	46,245	.....	46,245	Do.
Kings	2,400	.....	2,400	Do.
Lake	137,488	10,455	147,943	Do.
Merced	15,815	.....	15,815	Do.
Mendocino	195,759	19,565	215,324	Do.
Monterey	215,338	14,760	266,098	Do.
Napa	46,011	.....	46,011	Do.
San Benito	175,440	4,035	179,475	Do.
San Luis Obispo	250,455	5,332	255,787	Do.
Santa Barbara	47,489	.....	47,489	Do.
Santa Clara	58,720	4,924	63,644	Do.
Solano	1,988	.....	1,988	Do.
Sonoma	43,631	4,361	47,992	Do.
Stanislaus	24,979	2,926	27,905	Do.
Yolo	6,744	.....	6,744	Do.
Ventura	1,379	.....	1,379	Do.
Total	1,374,919	71,739	1,446,658	
Susanville:				
Lassen	942,320	81,852	1,024,172	Desert, grazing, mineral.
Modoc	288,400	15,824	304,224	Do.
Plumas	11,800	2,366	14,166	Mountainous, grazing, mineral.
Sierra	22,200	.....	22,200	Do.
Total	1,264,720	100,042	1,364,762	
Visalia:				
Fresno	125,964	11,480	137,444	Mountainous, grazing.
Kern	115,351	24,128	139,479	Do.
Kings	29,935	.....	29,935	Do.
Merced	8,361	.....	8,361	Do.
Monterey	1,920	.....	1,920	Do.
San Benito	8,586	.....	8,586	Do.
Tulare	38,000	50,868	88,868	Do.
Total	328,117	86,476	414,593	
State total	16,244,018	4,391,905	20,635,923	

COLORADO.

Del Norte:				
Alamosa	42,521	3,840	46,361	Farming, grazing.
Chaffee	3,108	.....	3,108	Mountainous, grazing, mineral.
Conejos	192,377	.....	192,377	Agricultural, grazing.
Fremont	1,598	.....	1,598	Mountainous.
Huerfano	6,840	3,840	10,680	Mountainous, grazing.
Las Animas	.....	29,440	29,440	Mountainous.
Rio Grande	105,518	.....	105,518	Farming, grazing.
Saguache	326,873	.....	326,873	Farming, grazing, mineral.
Total	678,835	37,120	715,955	

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

COLORADO—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Denver:				
Adams	2,340		2,340	Agricultural, grazing.
Arapahoe	1,720		1,720	Do.
Boulder	45,700	19,840	65,540	Mountainous, mineral.
Clear Creek	16,760	61,091	77,851	Do.
Douglas	3,980	25,700	29,680	Arid, grazing, broken.
Eagle	21,920		21,920	Mountainous, grazing, mineral.
Elbert	11,200		11,200	Agricultural, grazing.
Gilpin	12,240	3,200	15,440	Mountainous, grazing, mineral.
Grand	195,040		195,040	Mountainous, grazing.
Jackson	291,580		291,580	Do.
Jefferson	31,680	20,480	52,160	Do.
Larimer	319,780		319,780	Mountainous, grazing, agricultural.
Morgan	13,140		13,140	Grazing, agricultural.
Routt		7,680	7,680	Mountainous, grazing, mineral.
Summit	6,160		6,160	Do.
Weld	22,570		22,570	Agricultural, grazing.
Total	995,810	137,991	1,133,801	
Durango:				
Archuleta	102,793		102,793	Agricultural, timber, grazing.
Dolores	94,864	88,160	183,024	Mountainous, agricultural, mineral.
La Plata	206,231		206,231	Grazing, agricultural, mineral.
Montezuma	145,521	34,726	180,247	Do.
Total	549,409	122,886	672,295	
Glenwood Springs:				
Eagle	265,839	20,986	286,825	Farming, grazing, mineral.
Garfield	915,341	50,706	966,047	Do.
Mesa	111,461	20,227	131,688	Farming, grazing.
Moffat	2,195,632	31,737	2,227,369	Farming, grazing, mineral.
Pitkin	85,324	19,200	104,524	Grazing, mineral.
Rio Blanco	1,373,950	9,782	1,383,732	Farming, grazing.
Routt	161,500	152,355	313,855	Farming, grazing, mineral.
Total	5,109,047	304,993	5,414,040	
Hugo:				
Cheyenne	12,000	2,400	14,400	Prairie, farming, grazing.
Kit Carson	11,730	6,040	17,770	Do.
Lincoln	5,650		5,650	Do.
Total	29,380	8,440	37,820	
Lamar:				
Baca	267,568		267,568	Farming, prairie, hilly, grazing.
Bent	228,011		228,011	Broken, hilly, prairie, grazing.
Cheyenne	10,195		10,195	Prairie and grazing.
Kiowa	23,751		23,751	Rolling prairie, grazing.
Las Animas	262,582		262,582	Broken, hilly, and grazing.
Lincoln	804		804	Prairie and grazing.
Prowers	73,925		72,925	Prairie, hilly, and grazing.
Total	866,830		866,830	
Leadville:				
Chaffee	89,715		89,715	Grazing and mineral.
Fremont	15,369	23,877	39,246	Grazing and mountainous.
Lake	9,249		9,249	Mountainous, mineral.
Park	357,935	10,844	368,779	Grazing, agricultural, and mineral.
Summit	465		465	Mountainous, mineral.
Teller	7,449		7,449	Grazing and agricultural.
Total	480,182	34,721	514,903	
Montrose:				
Delta	258,525	56,963	315,488	Mountainous, coal, grazing.
Dolores	38,060	34,320	72,380	Mineral, grazing, arid.
Gunnison	936,401	397,157	1,333,558	Mountainous, coal, mineral, farming, grazing.
Hinsdale	230,073	42,212	272,285	Mountainous, mineral, timber, coal, grazing.

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

COLORADO—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Montrose—Continued.				
Mesa	576,664	338,850	915,514	Coal, farming, mineral, grazing.
Montrose	329,563	129,498	459,061	Do.
Ouray	248,917	.....	248,917	Agricultural, grazing, mineral, mountainous.
Saguache	346,262	.....	346,262	Farming, grazing, mineral, timber.
San Miguel	535,487	58,753	594,240	Agricultural, rich mineral, grazing, and coal.
Total	3,499,952	1,057,753	4,557,705	
Pueblo:				
Bent	62,120	.....	62,120	Agricultural, grazing.
Costilla	12,274	.....	12,274	Mountainous.
Crowley	70,600	6,840	77,440	Agricultural, grazing.
Custer	131,990	.....	131,990	Mountainous, grazing.
Elbert	800	.....	800	Agricultural, grazing.
El Paso	20,070	3,010	23,080	Mountainous, agricultural, grazing.
Fremont	389,381	.....	389,381	Do.
Huerfano	260,411	10,040	270,451	Do.
Kiowa	2,200	7,280	9,480	Grazing and agricultural.
Las Animas	1,397,910	.....	1,397,910	Mountainous, agricultural.
Lincoln	50,185	.....	50,185	Grazing and agricultural.
Otero	274,886	.....	274,886	Agricultural and grazing.
Pueblo	211,299	.....	211,299	Agricultural, mountainous.
Saguache	20,961	.....	20,961	Mountainous.
Teller	29,303	5,360	34,663	Mountainous, largely mineral.
Total	2,934,390	32,530	2,966,920	
Sterling:				
Logan	39,700	.....	39,700	Agricultural, grazing.
Morgan	24,820	.....	24,820	Do.
Phillips	8,300	.....	8,300	Do.
Sedgwick	2,820	.....	2,820	Do.
Washington	47,225	16,860	64,085	Do.
Weld	35,440	.....	35,440	Do.
Yuma	26,440	154,240	180,680	Do.
Total	184,745	171,100	355,845	
State total	15,328,580	1,907,534	17,236,114	

FLORIDA.

Gainesville:				
Alachua	2,940	.....	2,940	Low pine.
Baker	754	.....	754	Do.
Bay	4,486	.....	4,486	Do.
Bradford	1,039	.....	1,039	Do.
Brevard	16,059	15,648	31,707	Low pine swamp.
Calhoun	1,320	.....	1,320	Low pine.
Citrus	3,024	.....	3,024	Do.
Clay	1,682	.....	1,682	Do.
Columbia	756	.....	756	Do.
De Soto	8,728	.....	8,728	Do.
Duval	22	1,200	1,222	Do.
Escambia	921	.....	921	Do.
Gadsden	1,216	.....	1,216	Do.
Hamilton	547	.....	547	Do.
Hernando	1,105	.....	1,105	Do.
Holmes	138	.....	138	Do.
Jackson	267	.....	267	Do.
Jefferson	10	.....	10	Do.
Lafayette	8,000	.....	8,000	Low pine swamp.
Lake	19,019	.....	19,019	Low pine.
Lee	11,641	12,800	24,441	Low pine swamp.
Leon	120	.....	120	Low pine.
Levy	4,824	.....	4,824	Do.
Liberty	534	.....	534	Do.
Madison	516	.....	516	Do.
Manatee	2,072	.....	2,072	Do.

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

FLORIDA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Gainesville—Continued.				
Marion	9,980	.....	9,980	Low pine.
Monroe	1,881	.....	1,881	Low pine swamp.
Nassau	346	.....	346	Low pine.
Orange	1,930	8,320	10,250	Do.
Osceola	694	2,408	3,102	Do.
Pasco	400	.....	400	Do.
Polk	2,431	.....	2,431	Do.
Putnam	3,180	.....	3,180	Do.
St. John	2,208	.....	2,208	Do.
St. Lucie	651	78,235	78,886	Low pine swamp.
Santa Rosa	532	.....	532	Low pine.
Seminole	821	.....	821	Do.
Sumter	200	.....	200	Do.
Suwannee	440	.....	440	Do.
Taylor	2,740	.....	2,740	Do.
Volusia	9,156	13,080	22,236	Do.
Wakulla	560	.....	560	Do.
Walton	5,347	.....	5,347	Do.
Washington	1,556	.....	1,556	Do.
State total	136,793	131,691	268,484	

IDAHO.

Blackfoot:				
Bannock	285,010	141,960	426,970	Rolling plains, agricultural, and mountainous.
Bear Lake	80,840	28,480	109,320	Do.
Bingham	305,360	371,400	676,760	Do.
Bonneville	59,880	209,280	269,160	Do.
Franklin	1,920	1,280	3,200	Do.
Fremont	333,390	397,020	730,410	Do.
Jefferson	335,290	207,000	542,290	Do.
Lemhi	.....	1,920	1,920	Do.
Madison	30,380	25,200	55,580	Do.
Oneida	137,600	76,300	213,900	Do.
Power	79,500	46,000	125,500	Do
Total	1,649,170	1,522,860	3,172,030	
Boise:				
Ada	183,010	None.	183,010	Arid, mountainous.
Adams	74,993	None.	74,993	Mountainous, grazing, timbered.
Boise	222,563	36,490	259,053	Mountainous, timbered, grazing, mineral.
Canyon	185,256	6,400	191,656	Arid, grazing.
Elmore	424,449	17,665	442,114	Arid, mineral, mountainous.
Idaho	53,250	171,840	225,090	Arid, mountainous, grazing, mineral.
Owyhee	1,363,557	2,239,716	3,603,273	Arid, mountainous, mineral, grazing
Washington	315,592	47,896	363,488	Arid, mountainous, timbered, mineral.
Total	2,822,670	2,520,007	5,342,677	
Cœur d'Alene:				
Benewah [1]	9,185	.....	9,185	Agricultural, grazing, and timbered.
Bonner	24,872	.....	24,872	Do.
Kootenai	18,990	.....	18,990	Do.
Shoshone	67,318	14,080	81,398	Agricultural, grazing, timbered, and mineral.
Total	120,365	14,080	134,445	
Hailey:				
Bingham	23,308	27,268	50,576	Lava and sagebrush plains.
Blaine	898,775	1,120,454	2,019,229	Mountainous, grazing, sagebrush.
Boise	.....	112,500	112,500	Mountainous.
Cassia	433,061	28,480	461,541	Grazing, sagebrush, some mountains.
Custer	631,390	402,897	1,034,287	Mountainous, grazing, sagebrush.
Elmore	168,919	33,198	202,117	Do.
Fremont	43,895	33,880	77,775	Lava and sagebrush plains.

[1] Formerly part of Kootenai County.

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

IDAHO—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Hailey—Continued.				
Gooding	123,004	45,843	168,847	Lava and sagebrush plains.
Idaho	21,948	654,400	676,348	Mountainous, grazing, sagebrush.
Lemhi	426,911	291,593	718,504	Do.
Lincoln	273,810	351,606	625,416	Lava and sagebrush plains.
Minidoka	156,932	191,137	348,069	Do.
Owyhee	171,630	165,360	336,990	Grazing and sagebrush plains.
Power	74,521	53,007	127,528	Lava and sagebrush plains.
Twin Falls	270,931	138,598	409,529	Grazing and sagebrush plains.
Total	3,719,035	3,650,221	7,369,256	
Lewiston:				
Clearwater	26,679		26,679	Mountainous.
Idaho	105,351	3,600	108,951	Mountainous, scattering timber, chiefly grazing.
Latah	1,302		1,302	Mountainous.
Lewis	9,355		9,355	Mountainous, chiefly grazing.
Nez Perce	34,254	10,680	44,934	Mountainous, chiefly grazing, scattering timber.
Shoshone	2,644		2,644	Mountainous.
Total	179,585	14,280	193,865	
State total	8,490,825	7,721,448	16,212,273	

KANSAS.

Dodge City:				
Barber	228		228	Broken, sandy.
Clark	1,149		1,149	Do.
Comanche	200		200	Do.
Edwards	198		198	Do.
Finney	1,602		1,602	Do.
Grant	360		360	Broken, grazing.
Gray	40		40	Sandy, grazing.
Greeley	4,200		4,200	Agricultural.
Hamilton	15,974		15,974	Grazing, broken, sandy.
Hodgeman	40		40	Grazing, broken.
Kearny	1,320		1,320	Grazing, broken, sandy.
Kiowa	220		220	Do.
Lane	1,826		1,826	Grazing, broken.
Meade	4,939		4,939	Grazing, broken, sandy.
Morton	5,847		5,847	Do.
Ness	120		120	Grazing, broken.
Seward	4,258		4,258	Grazing, broken, sandy.
Scott	1,160		1,160	Grazing.
Stafford	41		41	Swampy.
Stanton	3,864		3,864	Grazing, agricultural.
Stevens	1,828		1,828	Grazing.
Wichita	280		280	Grazing, broken, sandy.
Total	49,694		49,694	
Topeka:				
Cheyenne	13,240		13,240	Rough, broken.
Decatur	40		40	Do.
Gove	4,120		4,120	Do.
Logan	3,600		3,600	Do.
Rawlins	2,680		2,680	Do.
Sherman	360		360	Do.
Trego	40		40	Do.
Thomas	40		40	Do.
Wallace	1,400		1,400	Do.
Total	25,520		25,520	
State total	75,214		75,214	

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

LOUISIANA.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Baton Rouge:				
Acadia	5		5	Prairie.
Allen	118		118	Pine woods.
Ascension	588		588	Swampy.
Avoyelles	1,503		1,503	Prairie, pine woods.
Beauregard	242		242	Pine woods.
Bienville	519		519	High pine woods.
Bossier	4,295		4,295	Do.
Caddo	1,696		1,696	Do.
Calcasieu	1,850		1,850	Prairie, pine woods.
Caldwell	5,243		5,243	High pine woods.
Cameron	1,582	21,128	22,710	Prairie, marsh.
Catahoula	4,440		4,440	High pine woods.
Claiborne	1,808		1,808	Pine woods.
Concordia	744		744	Alluvial.
De Soto	300		300	High pine woods.
East Baton Rouge	55		55	Pine.
East Carroll	549		549	Low pine woods.
East Feliciana	488		488	Pine woods.
Evangeline	40		40	Prairie, pine woods.
Franklin	143		143	Pine woods, hilly.
Grant	537		537	Do.
Iberia	2,034		2,034	Prairie, marsh.
Jackson	120		120	Pine woods, hilly.
La Salle	883		883	Pine woods.
Lafayette	279		279	Do.
La Fourche	96		96	Agricultural.
Lincoln	639		639	Do.
Livingston	249		249	Hardwoods.
Madison	238		238	Low pine woods, alluvial.
Morehouse	706		706	Pine woods.
Natchitoches	1,166		1,166	Do.
Ouachita	925		925	Do.
Plaquemines	1,736		1,736	Prairie, marsh.
Pointe Coupee	813		813	Ordinary farming, swampy.
Rapides	809		809	Pine woods, agricultural.
Red River	169		169	Pine woods.
Richland	609		609	Do.
Sabine	829		829	Do.
St. Bernard	4,491		4,491	Farming, swampy.
St. Charles	1,256		2,256	Do.
St. Helena	69		69	Pine woods.
St. James	434		434	Farming, swampy.
St. John	1,590		1,590	Do.
St. Landry	112		112	Prairie, pine woods.
St. Martin	1,021		1,021	Prairie, swampy.
St. Mary	428	7,231	7,659	Do.
St. Tammany	433		433	Pine woods.
Tangipahoa	2,020		2,020	Pine woods, swampy.
Tensas	1,664		1,664	Alluvial.
Terre Bonne	4,528		4,528	Low, swampy.
Union	1,295		1,295	Pine woods, farming.
Vermilion	1,780	10,038	11,818	Prairie.
Vernon	475		475	Pine woods.
Washington	114		114	Pine woods, farming.
Webster	1,001		1,001	Pine woods.
W. Bat. Rouge	159		159	Swampy.
West Carroll	79		79	Pine woods, farming.
West Feliciana	305		305	Do.
Winn	320		320	Do.
State total	62,619	38,397	101,016	

MICHIGAN.

Marquette:				
Alcona	445		445	Light soil.
Alger	2,438		2,438	Fair farming.
Alpena	440		440	Do.
Arenac	80		80	Do.
Baraga	3,125		3,125	Do.
Benzie	95		95	Do.

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

MICHIGAN—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Marquette—Continued.				
Charlevoix	1,738		1,738	Fair farming.
Cheyboygan	1,048		1,048	Do.
Chippewa	10,971		10,971	Timbered, farming.
Clare	463		463	Fair farming.
Delta	6,196		6,196	Do.
Dickenson	1,739		1,739	Do.
Gogebic	120		120	Do.
Grand Traverse	503		503	Do.
Houghton	211		211	Do.
Iosco	558		558	Light soil.
Iron	962		962	Sandy loam.
Jackson	145		145	Wet.
Kalkaska	1,178		1,178	Light soil.
Keweenaw	10,783		10,783	Do.
Lake	160		160	Very light soil.
Leelenaw	1,890		1,890	Fair farming.
Livingston	80		80	Wet.
Luce	4,495		4,495	Fair farming, some timber.
Mackinac	1,933		1,933	Fair farming.
Marquette	4,873		4,873	Timbered, farming.
Mason	31		31	Fair farming.
Mecosta	38		38	Third-rate farming.
Menominee	970		970	Timbered, farming.
Missaukee	357		357	Fair farming.
Montmorency	2,588		2,588	Do.
Muskegon	125		125	Do.
Oakland	240		240	Wet.
Oceana	610		610	Very sandy.
Ogemaw	160		160	Sandy, light soil.
Ontonagon	412		412	Timbered, farming.
Oscoda	901		901	Light soil.
Otsego	156		156	Fair farming.
Presque Isle	1,348		1,348	Fair farming, some timber.
Schoolcraft	11,385		11,385	Fair farming.
Wexford	40		40	Do.
State total	76,030		76,030	

MINNESOTA.

Cass Lake:				
Beltrami	203,500		203,500	Timbered, agricultural, swampy.
Cass	1,500		1,500	Timber, brush, and swamp.
Hubbard	300		300	Timbered, agricultural, rough.
Itasca	2,600		2,600	Timbered, agricultural, swampy.
Koochiching	197,500		197,500	Do.
Total	405,400		405,400	
Crookston:				
Beltrami	407,030		407,030	Swamp, some brush and timber.
Clearwater	2,600		2,600	Swamp, brush, and rock.
Roseau	41,787		41,787	Swamp, some brush, and timber.
Total	451,417		451,417	
Duluth:				
Aitkin	650		650	Agricultural, timber.
Cass	800		800	Do.
Carlton	200		200	Do.
Crow Wing	100		100	Timber, brush, swamp.
Cook	18,000		18,000	Light soil, timber, iron.
Hubbard	80		80	Agricultural, timber.
Itasca	1,700		1,700	Timber, agricultural, iron.
Koochiching	20,500		20,500	Agricultural, timber.
Lake	8,500		8,500	Timber, iron, light soil.
Morrison	74		74	Brush, sandy.
Ottertail	80		80	Agricultural.
Pine	170		170	Agricultural, broken.
Pope	40		40	Swampy.

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

MINNESOTA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Duluth—Continued.				
Stearns	40		40	Agricultural, brush.
St. Louis	36,000		36,000	Agricultural, timber, iron.
Wadena	80		80	Brush.
Total	87,014		87,014	
State total	943,831		943,831	

MISSISSIPPI.

Jackson:				
Adams	80		80	Agricultural, timbered.
Amite	400		400	Do.
Attala	2,120		2,120	Do.
Bolivar	160		160	Agricultural.
Calhoun	320		320	Do.
Carroll	320		320	Do.
Choctaw	360		360	Agricultural, timbered.
Claiborne	960		960	Agricultural.
Clarke	680		680	Do.
Clay	280		280	Agricultural, timbered.
Copiah	800		800	Agricultural.
Covington	80		80	Do.
Forrest	560		560	Pine woods, farming.
Franklin	1,227		1,227	Agricultural, timbered.
George	1,760		1,760	In pine belt, mostly level.
Greene	4,520		4,520	Agricultural, timbered.
Grenada	1,480		1,480	Do.
Hancock	440		440	Do.
Harrison	320		320	Do.
Hinds	80		80	Do.
Holmes	480		480	Do.
Jackson	3,520		3,520	Do.
Jasper	360		360	Do.
Jefferson	520		520	Farming, somewhat broken.
Jefferson Davis	160		160	Agricultural.
Jones	320		320	Agricultural, timbered.
Kemper	640		640	Do.
Lamar	120		120	Pine belt.
Lauderdale	320		320	Do.
Lawrence	200		200	Timbered, farming.
Leake	841		841	Agricultural, timbered.
Leflore	40		40	Hilly, farming.
Lincoln	360		360	Do.
Lowndes	240		240	Farming.
Madison	280		280	Agricultural lands.
Marion	40		40	Level, farming, and grazing.
Monroe	1,520		1,520	Agricultural, timbered.
Montgomery	1,200		1,200	Do.
Neshoba	40		40	Do.
Newton	160		160	Do.
Noxubee	360		360	Do.
Oktibbeha	200		200	Generally level, farming, and grazing.
Panola	120		120	Do.
Pearl River	360		360	Level, pine woods.
Perry	1,120		1,120	Agricultural, timbered.
Pike	240		240	Do.
Quitman	280		280	Do.
Rankin	480		480	Do.
Scott	360		360	Do.
Simpson	40		40	Do.
Smith	440		440	Generally level, farming, grazing.
Sunflower	94		94	Do.
Tallahatchie	520		520	Do.
Washington	400		400	Agricultural, timbered.
Wayne	1,600		1,600	Do.
Wilkinson	640		640	Do.
Winston	520		520	Do.
Yalobusha	720		720	Swampy, farming.
Yazoo	80		80	Agricultural.
State total	36,882		36,882	

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

MISSOURI.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Springfield:				
Barry	17		17	
Butler	3		3	
Camden	240		240	
Carroll	130		130	
Carter	15		15	
Laclede	40		40	
Ozark	185		185	
Phelps	40		40	
Ripley	5		5	
Shannon	48		48	
Taney	80		80	
Wayne	40		40	
Wright	80		80	
State total	923		923	

MONTANA.

Billings:				
Bighorn	92,980	15,360	108,340	Mountainous, agricultural, grazing.
Carbon	174,480	149,366	323,846	Do.
Musselshell	27,683		27,683	Do.
Rosebud	178,124		178,124	Agricultural, grazing.
Stillwater	9,111		9,111	Do.
Yellowstone	56,683	33,982	90,665	Do.
Total	539,061	198,708	737,769	
Bozeman:				
Beaverhead	11,944	24,264	36,208	Mostly grazing.
Broadwater	24,216		24,216	Principally arid.
Carbon	15,321	7,680	23,001	Rolling and and grazing, some fair agricultural.
Gallatin	4,600		4,600	Mostly grazing, small amount farming.
Jefferson	20,331	8,723	29,054	Grazing and arid, mountainous.
Madison	115,993	115,378	231,371	Arid and dry farming.
Park	27,282	12,379	39,661	Grazing and dry farming.
Stillwater	38,803		38,803	Do.
Sweetgrass	159,788		159,788	Grazing, mountainous, and dry farming.
Total	418,278	168,424	586,702	
Glasgow:				
Dawson	116,167	273,280	389,447	Agricultural and grazing.
Phillips	406,140	723,200	1,129,340	Do.
Richland	85,445	200,320	285,765	Do.
Sheridan	662,813		662,813	Do.
Valley	1,646,135	897,280	2,543,415	Do.
Total	2,916,700	2,094,080	5,010,780	
Great Falls:				
Cascade	72,697	68,906	141,603	Grazing, agricultural.
Chouteau	158,940		158,940	Do.
Fergus	8,180		8,180	Broken, grazing land.
Hill	27,700		27,700	Grazing, agricultural.
Lewis and Clark	13,448	160	13,608	Mountainous, agricultural.
Teton	163,224	30,080	193,304	Grazing, agricultural.
Toole	84,702		84,702	Do.
Total	528,891	99,146	628,037	
Havre:				
Blaine	280,180	396,750	676,930	Mountainous, agricultural, grazing.
Chouteau	91,160	134,500	225,660	Do.
Hill	191,520	26,575	218,095	Do.
Phillips	194,960	667,000	861,960	Do.
Toole	34,580	4,160	38,740	Do.
Total	792,400	1,228,985	2,021,385	

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

MONTANA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Helena:				
Beaverhead	178,050	165,664	343,714	Mountainous, agricultural, grazing.
Broadwater	74,611	42,689	117,300	Do.
Cascade	7,012	9,134	16,146	Do.
Deer Lodge	22,679	15,134	37,813	Do.
Gallatin	6,050	.....	6,050	Do.
Granite	67,894	30,592	98,486	Do.
Jefferson	56,042	40,050	96,092	Do.
Lewis and Clark	482,700	55,209	537,909	Do.
Madison	170,301	284,460	454,761	Do.
Meagher	157,793	47,817	205,610	Do.
Park	4,580	10,419	14,999	Do.
Powell	63,029	151,495	214,524	Do.
Silver Bow	54,524	5,400	59,924	Do.
Sweet Grass	5,441	.....	5,441	Do.
Teton	16,650	.....	16,650	Do.
Total	1,367,356	858,063	2,225,419	
Kalispell:				
Flathead	66,475	.....	66,475	Mountainous valleys, timber, agricultural, and grazing.
Lincoln	3,980	.....	3,980	Do.
Sanders	31,600	.....	31,600	Do.
Teton	7,680	.....	7,680	Mountainous, agricultural and grazing.
Total	109,735	.....	109,735	
Lewistown:				
Chouteau	24,160	.....	24,160	Broken, grazing.
Dawson	223,448	46,720	270,168	Farming, grazing, timber.
Fergus	562,064	811,721	1,373,785	Farming, grazing, timber, mining, mountainous.
Meagher	10,264	29,380	39,644	Farming, grazing.
Musselshell	28,632	35,840	64,472	Agricultural, grazing.
Rosebud	3,064	.....	3,064	Farming, grazing, broken.
Sweetgrass	4,429	.....	4,429	Farming, grazing.
Total	856,061	923,661	1,779,722	
Miles City:				
Big Horn	131,520	136,040	267,560	Agricultural and grazing.
Custer	1,245,920	352,480	1,598,400	Do.
Dawson	346,080	1,071,520	1,417,600	Do.
Fallon	645,120	717,280	1,362,400	Do.
Prairie	96,160	13,120	109,280	Do.
Richland	20,320	.....	20,320	Do.
Rosebud	557,120	209,600	766,720	Do.
Wibaux	34,400	.....	34,400	Do.
Total	3,076,640	2,500,040	5,576,680	
Missoula:				
Beaverhead	18,380	11,000	29,380	Arid, grazing.
Granite	21,462	79,000	100,462	Mountainous, timber, mineral.
Missoula	43,830	61,765	105,595	Mountainous, timber, mineral, small valleys.
Mineral	59,248	.....	59,248	Mountainous, timber, mineral.
Powell	1,280	2,880	4,160	Mountainous, timber, mineral, grazing.
Ravalli	6,172	388	6,560	Mountainous, timber, grazing.
Sanders	49,325	34,162	83,487	Mountainous, timber, mineral, and agricultural.
Total	199,697	189,195	388,892	
State total	10,804,819	8,260,302	19,065,121	

NEBRASKA.

Alliance:				
Banner	1,200	.....	1,200	High table-land, hilly.
Box Butte	1,360	.....	1,360	Broken, grazing, sandy.
Dawes	2,240	.....	2,240	Very rough, grazing.
Garden	10,360	240	10,600	Sand hills, grazing.

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

NEBRASKA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Alliance—Continued.				
Morrill	3,900	8,080	11,980	Sand hills, grazing.
Scottsbluff	1,157	.....	1,157	Prairie, sandy, grazing.
Sheridan	12,360	.....	12,360	Prairie, sand hills, grazing.
Sioux	9,840	.....	9,840	Very broken, rough, sandy.
Total	42,417	8,320	50,737	
Broken Bow:				
Arthur	2,400	.....	2,400	Sand hills, grazing.
Blaine	2,320	.....	2,320	Do.
Brown	3,080	.....	3,080	Do.
Cherry	15,640	.....	15,640	Do.
Custer	200	.....	200	Rough, grazing.
Grant	6,640	240	6,880	Sand hills, grazing.
Hooker	11,120	3,837	14,957	Do.
Logan	1,600	.....	1,600	Rolling, grazing.
McPherson	2,560	.....	2,560	Sand hills, grazing.
Thomas	5,500	.....	5,500	Do.
Total	51,060	4,077	55,137	
Lincoln:				
Chase	1,640	.....	1,640	Broken, sandy, grazing.
Dundy	1,140	.....	1,140	Do.
Frontier	200	.....	200	Do.
Hayes	1,100	.....	1,100	Broken, grazing.
Hitchcock	776	.....	776	Rough, sandy, grazing.
Redwillow	280	.....	280	Broken, grazing.
Total	5,136	.....	5,136	
North Platte:				
Arthur	2,324	.....	2,324	Grazing.
Banner	320	.....	320	Do.
Cheyenne	520	.....	520	Do.
Custer	40	.....	40	Do.
Deuel	150	.....	150	Do.
Garden	1,233	.....	1,233	Do.
Keith	757	.....	757	Do.
Kimball	472	.....	472	Do.
Lincoln	2,068	.....	2,068	Do.
Logan	160	.....	160	Do.
McPherson	1,120	.....	1,120	Do.
Morrill	442	.....	442	Do.
Perkins	242	.....	242	Very sandy.
Total	9,848	.....	9,848	
O'Neill:				
Antelope	40	.....	40	Sandy, grazing.
Boyd	160	.....	160	Do.
Dakota	166	.....	166	Sand bar in river.
Garfield	1,680	.....	1,680	Sandy, grazing.
Holt	1,380	.....	1,380	Do.
Keyapaha	14	.....	14	Sand bar.
Loup	2,960	.....	2,960	Sandy, grazing.
Rock	640	.....	640	Do.
Washington	40	.....	40	Sand bar in river.
Wheeler	360	.....	360	Sandy, grazing.
Total	7,440	.....	7,440	
Valentine:				
Brown	3,520	.....	3,520	Rough, sandy, grazing.
Cherry	58,260	.....	58,260	Do.
Keyapaha	680	.....	680	Do.
Rock	1,600	.....	1,600	Do.
Total	64,060	.....	64,060	
State total	179,961	12,397	192,358	

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

NEVADA.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Carson City:				
Churchill	1,259,071	1,390,577	2,649,648	Mountainous, arid, grazing land, little timber.
Clark	3,166,480	1,171,388	4,337,868	Do.
Douglas	178,220	14,340	192,560	Do.
Esmeralda	1,083,901	906,568	1,990,469	Do.
Eureka	18,030	40,070	58,100	Mountainous, arid, grazing land, no timber.
Humboldt	2,419,732	3,914,852	6,334,584	Do.
Lander	86,368	44,160	130,528	Do.
Lincoln	2,008,568	4,053,165	6,061,733	Do.
Lyon	305,328	268,929	574,257	Do.
Mineral	1,163,830	717,740	1,881,570	Mountainous, arid, little timber.
Nye	3,333,741	5,548,203	8,881,944	Mountainous, arid, grazing land, little timber.
Ormsby	26,326	19,980	46,306	Mountainous, arid, grazing land, second growth.
Storey	98,000	1,272	99,272	Mountainous, arid, grazing land, no timber.
Washoe	1,970,019	960,374	2,930,393	Mountainous, arid, grazing land, second growth.
White Pine	.....	19,300	19,300	Mountainous, arid, grazing land, little timber.
Total	17,117,614	19,070,918	36,188,532	
Elko:				
Churchill	128,510	7,000	135,510	Mountainous, arid, grazing, little timber.
Elko	6,139,849	1,017,239	7,157,088	Do.
Eureka	861,063	1,286,628	2,147,691	Mountainous, arid, grazing, no timber.
Humboldt	1,095,119	350,773	1,445,892	Do.
Lander	934,665	1,477,242	2,411,907	Do.
Lincoln	518,779	241,761	760,540	Do.
Nye	385,349	193,558	578,907	Mountainous, arid, grazing, little timber.
White Pine	2,653,555	1,938,224	4,591,779	Do.
Total	12,716,789	6,512,425	19,229,214	
State total	29,834,403	25,583,343	55,417,746	

NEW MEXICO.

Clayton:				
Colfax	45,620	.....	45,620	Arid, broken, grazing.
Mora	23,680	.....	23,680	Mostly grazing, some broken.
Quay	12,800	.....	12,800	Grazing.
San Miguel	26,800	.....	26,800	Do.
Union	394,000	.....	394,000	Grazing, broken.
Total	502,900	.....	502,900	
Fort Sumner:				
Chaves	610,733	.....	610,733	Broken, grazing.
Curry	15,214	.....	15,214	Grazing.
Guadalupe	458,952	.....	458,952	Broken, grazing.
Lincoln	468,993	.....	468,993	Grazing.
Roosevelt	98,306	.....	98,306	Broken, grazing.
Total	1,652,198	.....	1,652,198	
Las Cruces:				
Dona Ana	1,483,460	223,983	1,707,443	Grazing, mountainous.
Grant	700,156	1,113,544	1,813,700	Do.
Luna	766,483	370,850	1,137,333	Do.
Otero	1,158,035	470,597	1,628,632	Do.
Sierra	1,377,944	216,300	1,594,244	Do.
Socorro	2,297,183	1,208,860	3,506,043	Do.
Total	7,783,261	3,604,134	11,387,395	

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

NEW MEXICO—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Roswell:				
Chaves	980,270	474,716	1,454,986	Grazing, rolling prairie.
Eddy	1,798,680	1,045,782	2,844,462	Mostly prairie, timber in mountains.
Lincoln	718,835	349,319	1,068,154	Grazing, timber in mountains.
Otero	192,791	696,076	888,867	Grazing.
Socorro	.....	102,400	102,400	Undulating prairie.
Torrance	147,442	.....	147,442	Prairie, grazing.
Total	3,838,018	2,668,293	6,506,311	
Santa Fe:				
Bernalillo	65,419	21,700	87,119	Timber, grazing, and agricultural.
Colfax	13,680	.....	13,680	Mountainous, grazing, coal.
Guadalupe	425,052	16,550	441,602	Grazing, agricultural.
McKinley	527,507	154,891	682,398	Mountainous, timber, grazing, coal.
Mora	92,823	17,464	110,287	Mountainous, grazing, agricultural.
Rio Arriba	463,203	201,011	664,214	Mountainous, grazing, agricultural, coal.
Sandoval	337,230	339,675	676,905	Do.
San Juan	807,272	495,914	1,303,186	Grazing, agricultural, coal.
San Miguel	260,037	102,435	362,472	Timber, grazing, agricultural.
Santa Fe	185,085	113,160	298,245	Mountainous, grazing, coal.
Socorro	742,913	58,834	801,747	Do.
Taos	253,754	224,834	478,588	Mountainous, timber, grazing, agricultural.
Torrance	450,658	147,840	598,498	Timber, grazing, agricultural, saline.
Valencia	778,972	102,491	881,463	Do.
Total	5,403,605	1,996,799	7,400,404	
Tucumcari:				
Curry	2,054	.....	2,054	Partly level and partly broken land. Agricultural and grazing land.
Guadalupe	51,275	.....	51,275	Mostly broken grazing land. Some good agricultural land.
Quay	174,189	11,567	185,756	Do.
San Miguel	8,206	5,753	13,959	Do.
Union	68,105	18,000	86,105	Sandy grazing lands. Some good agricultural land.
Total	303,829	35,320	339,149	
State total	19,483,811	8,304,546	27,788,357	

NORTH DAKOTA.

Bismarck:				
Burleigh	2,668	.....	2,668	Agricultural and grazing.
Emmons	1,357	.....	1,357	Do.
Kidder	3,225	.....	3,225	Do.
Logan	2,001	.....	2,001	Do.
Mercer	1,774	.....	1,774	Do.
Morton	8,803	.....	8,803	Do.
McIntosh	1,340	.....	1,340	Do.
McLean	1,119	.....	1,119	Do.
Oliver	1,101	.....	1,101	Do.
Ransom	40	.....	40	Do.
Richland	40	.....	40	Do.
Sargent	31	.....	31	Do.
Sheridan	992	.....	992	Do.
Sioux	38,840	.....	38,840	Do.
Stutsman	8	.....	8	Do.
Wells	160	.....	160	Do.
Total	63,499	.....	63,499	
Dickinson:				
Billings	63,260	.....	63,260	Agricultural, rough, grazing.
Bowman	48,120	.....	48,120	Do.
Dunn	40,720	.....	40,720	Do.

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

NORTH DAKOTA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Dickinson—Continued.				
Golden Valley	19,040		19,040	Agricultural, rough, grazing.
McKenzie	109,520		109,520	Do.
Slope	30,280		30,280	Do.
Total	310,940		310,940	
Minot:				
Benson	516		516	Prairie, farming.
Bottineau	79		79	Grazing, farming.
Burke	1,198		1,198	Do.
Cavalier	480		480	Do.
Eddy	72		72	Do.
Grand Forks	240		240	Do.
McHenry	2,104		2,104	Do.
McLean	1,932		1,932	Do.
Mountrail	12,783		12,783	Do.
Pierce	1,419		1,419	Do.
Renville	318		318	Do.
Ward	2,649		2,649	Do.
Total	23,790		23,790	
Williston:				
Burke	360		360	Broken, grazing.
Divide	5,731		5,731	Do.
Mountrail	4,467		4,467	Do.
McKenzie	63,717		63,717	Broken, grazing, farming.
Williams	21,163		21,163	Do.
Total	95,438		95,438	
State total	493,667		493,667	

OKLAHOMA.

Guthrie:				
Beckham	3,742		3,742	Grazing.
Blaine	884		884	Do.
Canadian	562		562	Sandy, grazing.
Cleveland	442		442	Do.
Custer	403		403	Do.
Dewey	4,201		4,201	Do.
Ellis	3,989		3,989	Do.
Grant	33		33	Do.
Greer	1,239		1,239	Grazing.
Harmon	1,261		1,261	Rough, grazing.
Jackson	2,367		2,367	Sandy, grazing.
Kingfisher	437		437	Do.
Lincoln	10		10	Farming.
Logan	9		9	Sandy.
Oklahoma	6		6	Rough, grazing.
Pottawatomie	85		85	Sandy, grazing.
Roger Mills	4,328		4,328	Mostly rough, grazing.
Total	23,998		23,998	
Woodward:				
Alfalfa	1,355		1,355	Grazing
Beaver	1,164		1,164	Do.
Cimarron	8,720		8,720	Do.
Harper	319		319	Do.
Major	2,528		2,528	Do.
Texas	2,250		2,250	Do.
Woods	906		906	Do.
Woodward	937		937	Do.
Total	18,179		18,179	
State total	42,177		42,177	

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

OREGON.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Burns:				
Crook	76,959		76,959	Grazing, timber, farming.
Grant	160,372	480	160,852	Do.
Harney	3,720,943	37,596	3,758,539	Do.
Wheeler	12,800		12,800	Do.
Total	3,971,074	38,076	4,009,150	
La Grande:				
Baker	287,320	4,899	292,219	Timbered, mountainous, grazing, farming, fruit, and mineral.
Grant	129,300		129,300	Timbered, farming, grazing, and mineral.
Morrow	26,920		26,920	Timbered, farming, and grazing.
Umatilla	65,880	291	66,171	Arid, farming, timbered, and grazing.
Union	23,540		23,540	Timbered, farming, and grazing.
Wallowa	71,840	12,420	84,260	Generally rolling, farming, timbered, and grazing-mineral.
Total	604,800	17,610	622,410	
Lakeview:				
Crook	399,985		399,985	Grazing, agricultural, mountainous.
Klamath	789,346	110,692	900,038	Grazing, agricultural, timber.
Lake	2,227,907	277,344	2,505,251	Agricultural, grazing, timber, mountainous.
Total	3,417,238	388,036	3,805,274	
Portland:				
Benton	2,665		2,665	Timber, grazing, farming.
Clackamas	9,285		9,285	Mountainous, timber, grazing, farming
Clatsop	830		830	Broken, grazing, agricultural.
Linn	1,555		1,555	Do.
Lincoln	4,058		4,058	Do.
Multnomah	1,360		1,360	Mountainous.
Marion	126		126	Broken, grazing, agricultural.
Polk	600		600	Do.
Tillamook	21,042		21,042	Broken, timbered, grazing, farming.
Washington	320		320	Do.
Yamhill	370		370	Do.
Total	42,211		42,211	
Roseburg:				
Benton	3,170		3,170	Timber, grazing.
Coos	15,641	1,260	16,901	Timber, agricultural.
Curry	36,785	3,613	40,398	Mountainous, timber.
Douglas	34,031	5,600	39,631	Mineral, grazing, timber.
Jackson	55,225	1,920	57,145	Timber, grazing, fruit.
Josephine	32,819	8,336	41,155	Timber, farming, mineral.
Klamath	638		638	Timber.
Lane	29,086		29,086	Timber, farming, mineral.
Lincoln	1,010		1,010	Broken, grazing.
Linn	319		319	Hilly, grazing.
Total	208,724	20,729	229,453	
The Dalles:				
Crook	524,560	1,260	525,820	Grazing, broken, hilly, mountainous.
Gilliam	54,350	1,760	56,110	Do.
Grant	44,180		44,180	Do.
Hoodriver	40		40	Do.
Jefferson [1]	152,400	7,680	160,080	Do.
Morrow	8,530		8,530	Do.
Sherman	45,310	640	45,950	Do.
Vasco	140,140		140,140	Do.
Wheeler	185,390		185,390	Do.
Total	1,154,900	11,340	1,166,240	

[1] Created out of Crook County in 1915.

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

OREGON—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Vale:				
Baker	243,883		243,883	Grazing, dry farming, timber.
Grant	16,360		16,360	Mountainous, timber.
Harney	401,978		401,978	Grazing, dry farming.
Malheur	3,543,565	1,361,654	4,905,219	Grazing, dry farming, some timber.
Total	4,205,786	1,361,654	5,567,440	
State total	13,604,733	1,837,445	15,442,178	

SOUTH DAKOTA.

Bellefourche:				
Butte	415,550		415,550	Prairie, grazing, and farming.
Harding	170,986		170,986	Do.
Lawrence	2,923		2,923	Mountainous.
Meade	31,922		31,922	Broken, grazing.
Total	621,381		621,381	
Gregory:				
Bennett	108,795		108,795	Grazing, sand hills.
Gregory	656		656	Very rough; grazing.
Lyman	4,626		4,626	Do.
Mellette	64,323		64,323	Rough and rolling; grazing.
Tripp	5,120		5,120	Not subject to entry; to be sold under act Mar. 2, 1907.
Total	183,520		183,520	
Lemmon:				
Corson	189,480		189,480	Prairie, rough, rolling; many buttes, stony hills.
Harding	154,073		154,073	Do.
Perkins	112,460		112,460	Do.
Sioux (N. Dak.)	8,757		8,757	Do.
Total	464,770		464,770	
Pierre:				
Campbell	900		900	Rough, grazing.
Charles Mix	106		106	Do.
Clark	200		200	Low and wet.
Day	133		133	Low and wet. Small tracts.
Edmunds	80		80	Low and wet.
Haakon	64,440		64,440	Rough, broken, grazing.
Hughes	920		920	Do.
Jackson	35,350		35,350	Rough, grazing, Bad Lands (part).
Kingsbury	51		51	Low and wet. Small tracts.
Lyman	11,161		11,161	Rough, grazing.
Marshall	40		40	Do.
Potter	840		840	Do.
Spink	680		680	Lake, overflowed.
Stanley	156,700		156,700	Rough, broken, grazing.
Sully	7,120		7,120	Do.
Walworth	266		266	Rough, grazing.
Total	278,987		278,987	
Rapid City:				
Custer	70,682	35,163	105,845	Partly mountainous, mineral, timbered, grazing, agricultural.
Fall River	243,832		243,832	Prairie, part broken, grazing, agricultural.
Lawrence	919	18,618	19,537	Partly mountainous, timbered, mineral, grazing.
Meade	191,060		191,060	Prairie, agricultural, grazing.
Pennington	168,056		168,056	Part mountainous, part prairie, timbered, mineral, grazing, agricultural.
Total	674,549	53,781	728,330	

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

SOUTH DAKOTA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Timber Lake:				
Corson	131,361		131,361	Grazing, farming, broken.
Dewey	161,360		161,360	Do.
Ziebach	364,900		364,900	Do.
Total	657,621		657,621	
State total	2,880,828	53,781	2,934,609	

UTAH.

Salt Lake City:				
Beaver	408,372	902,794	1,311,166	Generally arid, agricultural, grazing, mountainous.
Box Elder	1,403,455	569,890	1,973,345	Do.
Cache	34,054	227,537	261,591	Do.
Carbon	592,729	127,188	719,917	Do.
Davis	32,682	10,964	43,646	Do.
Emery	474,313	1,100,790	1,575,103	Do.
Garfield	500,386	2,014,849	2,515,235	Do.
Grand	695,936	1,205,124	1,901,060	Do.
Iron	1,090,724	30,198	1,120,922	Do.
Juab	640,887	1,098,415	1,739,302	Do.
Kane	565,439	1,724,663	2,290,102	Do.
Millard	1,129,585	2,297,134	3,426,719	Do.
Morgan	48,000	62,246	110,246	Do.
Piute	111,971	78,795	190,766	Do.
Rich	272,495	9,967	282,462	Do.
Salt Lake	16,184	29,318	45,502	Do.
San Juan	663,826	3,153,416	3,817,242	Do.
Sanpete	290,050	38,691	328,741	Do.
Sevier	531,191	185,771	716,962	Do.
Summit	104,832	7,557	112,389	Do.
Tooele	1,271,921	2,356,248	3,628,169	Do.
Utah	99,466	316,577	416,043	Do.
Wasatch	202,816	148,406	351,222	Do.
Washington	686,657	179,795	866,452	Do.
Wayne	201,227	1,078,076	1,279,303	Do.
Weber	81,789	25,211	107,000	Do.
Total	12,150,987	18,979,620	31,130,607	
Vernal:				
Duchesne	293,876		293,876	Agricultural, grazing.
Summit	6,027		6,027	Mountainous.
Uinta	1,045,799	834,862	1,880,661	Arid, mountainous, mineral, agricultural, grazing.
Wasatch	48,706	3,960	52,666	Do.
Total	1,394,408	838,822	2,233,230	
State total	13,545,395	19,818,442	33,363,837	

WASHINGTON.

North Yakima:				
Benton	70,520		70,520	Arid, mountainous.
Grant	25,280		25,280	Do.
Kittitas	113,120		113,120	Arid, mountainous, timbered.
Yakima	83,720	960	84,680	Arid, mountainous, some timber.
Total	292,640	960	293,600	
Seattle:				
Chehalis	80		80	Mountainous, poor timber.
Clallam	1,600	600	2,200	Burned over.
Jefferson	200		200	Rough.

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

WASHINGTON—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Seattle—Continued.				
King	2,020	[1] 72,740	74,760	Timbered.
Mason	400	.....	400	Mountainous.
San Juan	800	.....	800	Poor timber.
Skagit	3,000	4,000	7,000	Rough, timbered.
Snohomish	.....	[2] 44,120	44,120	Timbered.
Whatcom	4,000	1,000	5,000	Rough.
Total	12,100	122,460	134,560	
Spokane:				
Adams	3,232	.....	3,232	Arid, scabland.
Douglas	333	.....	333	Mountainous, arid.
Ferry	17,013	2,066	19,079	Agricultural, grazing, timber, mineral.
Lincoln	31,239	.....	31,239	Arid, agricultural, grazing.
Okanogan	16,085	.....	16,085	Mineral, grazing, farming.
Pend Oreille	40,507	.....	40,507	Agricultural, timbered, grazing, mountainous.
Spokane	726	.....	726	Arid, rough.
Stevens	120,395	6,877	127,272	Agricultural, mineral, grazing, mountainous.
Whitman	369	.....	369	Grazing.
Total	229,849	8,943	238,792	
Vancouver:				
Clarke	2,920	.....	2,920	Mountainous, timbered, grazing.
Cowlitz	1,270	3,200	4,470	Do.
Klickitat	26,020	2,810	28,830	Rough, timbered, grazing, farming.
Lewis	2,226	6,755	8,981	Timbered, rough, grazing, farming.
Pacific	140	.....	140	Rough, broken.
Skamania	5,280	.....	5,280	Mountainous, timbered, grazing.
Wahkiakum	160	.....	160	Rough, broken.
Total	38,016	12,765	50,781	
Walla Walla:				
Adams	8,870	.....	8,870	Grazing, desert, poor farming.
Asotin	38,160	.....	38,160	Mountainous, grazing, some timber.
Benton	31,660	.....	31,660	Desert, grazing.
Columbia	6,960	.....	6,960	Grazing, mountainous, some timber.
Franklin	31,620	.....	31,620	Grazing, desert.
Garfield	3,520	.....	3,520	Grazing, farming, some timber.
Klickitat	9,685	.....	9,685	Grazing, desert.
Walla Walla	4,600	.....	4,600	Grazing, some timber.
Whitman	4,800	.....	4,800	Grazing, some farming.
Total	139,875	.....	139,875	
Waterville:				
Chelan	14,280	1,760	16,040	Mountainous, timber, grazing.
Douglas	36,720	4,020	40,740	Rough, grazing.
Grant	78,940	.....	78,940	Sandy, grazing.
Kittitas	545	.....	545	Rough, grazing.
Okanogan	89,872	60,860	150,732	Mountainous, farming, grazing.
Total	220,357	66,640	286,997	
State total	932,837	211,768	1,144,605	

WISCONSIN.

Wausau:				
Adams	90	.....	90	Sandy soil.
Ashland	281	.....	281	Do.
Bayfield	1,638	.....	1,638	Rolling, somewhat sandy.
Barron	40	.....	40	Broken.
Buffalo	120	.....	120	Do.
Burnett	472	.....	472	Fair agricultural, some sandy.
Chippewa	40	.....	40	Broken.

[1] Including 70,820 acres within odd-section grant to the Northern Pacific Ry. Co.
[2] Including 43,880 acres within odd-section grant to the Northern Pacific Ry. Co.

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

WISCONSIN—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Wausau—Continued.				
Clark	80		80	Grazing, agricultural.
Crawford	4		4	Agricultural.
Douglas	520		520	Fair agricultural, some sandy.
Eau Claire	40		40	Do.
Florence	200		200	Rough, hardwood.
Forest	80		80	Do.
Iron	40		40	Do.
Jackson	240		240	Rolling, sandy loam.
Langlade	80		80	Hardwood, little rough.
Marinette	560		560	Agricultural.
Monroe	108		108	Some sandy.
Oconto	240		240	Hardwood, sandy with ledges of rock.
Oneida	419		419	Rocky, soil sandy loam.
Polk	365		365	Fair agricultural, some sandy soil.
Price	452		452	Hardwood.
Rusk	96		96	Do.
Sawyer	309		309	Do.
Trempealeau	40		40	Rough, broken.
Vilas	41		41	Sandy soil.
Washburn	128		128	Some clay, sandy soil.
Waushara	40		40	Fair agricultural.
State total	6,758		6,758	

WYOMING.

Buffalo:				
Big Horn	1,014,305	45,120	1,059,425	Grazing, mountainous, agricultural.
Campbell	553,437		553,437	Do.
Converse	10,564		10,564	Do.
Hot Springs	175,375		175,375	Do.
Johnson	1,753,383		1,753,383	Do.
Natrona	53,617		53,617	Do.
Sheridan	419,550	22,840	442,390	Do.
Washakie	1,084,554		1,084,554	Do.
Total	5,064,785	67,960	5,132,745	
Cheyenne:				
Albany	1,004,774	21,581	1,026,355	About one-half broken, mountainous; other half prairie, grazing, farming; farm land mostly along streams.
Carbon	2,051,825	10,701	2,062,526	Greater portion broken, mountainous, some timber, agricultural land along streams.
Fremont	159,311	32,979	192,290	Mountainous, arid, timber.
Goshen	401,895		401,895	Broken, grazing, dry farming.
Laramie	140,069		140,069	Prairie, broken grazing, dry farming, land along streams irrigable.
Platte	468,120		468,120	Prairie, broken grazing, dry farming.
Sweetwater	545,973		545,973	Mountainous, broken grazing, alkaline plains.
Total	4,771,967	65,261	4,837,228	
Douglas:				
Converse	1,751,117	43,490	1,794,597	Grazing, mountainous, mineral.
Fremont	972,711		972,711	Do.
Natrona	2,781,387		2,781,387	Do.
Niobrara	890,573		890,573	Do.
Total	6,395,788	43,490	6,439,268	
Evanston:				
Fremont	556,580	583,337	1,139,917	Mountainous, grazing, timber.
Sweetwater	3,729,097	338,947	4,068,044	Mountainous, dry farming, alkaline.
Uinta-Lincoln	1,564,097	597,400	2,161,497	Mountainous, dry farming, grazing.
Total	5,849,774	1,519,684	7,369,458	

Statement, by States, land districts, and counties, showing the area of land unappropriated and unreserved on July 1, 1915—Continued.

WYOMING—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Unsurveyed.	Total.	
Lander:				
Big Horn	154,589		154,589	Mountainous, timberland, farming, and grazing.
Fremont	1,915,226	41,840	1,957,066	Arid, mineral, mountainous, grazing, and timber.
Park	867,420	41,144	908,564	Grazing, farming, mineral, timber, and stone, arid.
Hot Springs	661,443	94,465	755,908	Mineral, grazing, arid, farming, timber, stone.
Washakie	31,555		31,555	Farming, grazing, arid, timber, stone, mineral.
Total	3,630,233	177,449	3,807,682	
Sundance:				
Campbell	1,790,402		1,790,402	Broken, grazing.
Converse	35,060		35,060	Prairie and grazing; good for farming.
Crook	338,046	266,170	604,216	Semimountainous, with fertile valleys.
Niobrara	19,060		19,060	Broken, grazing.
Weston	894,850		894,850	Timber, grazing, and farming.
Total	3,077,418	266,170	3,343,588	
State total	28,789,965	2,140,004	30,929,969	

RECAPITULATION BY STATES.

State.	Area in acres.		
	Surveyed.	Unsurveyed.	Total.
Alabama	47,940		47,940
Arizona	10,686,788	26,123,539	36,810,327
Arkansas	258,115	20,040	278,155
California	16,244,018	4,391,905	20,635,923
Colorado	15,328,580	1,907,534	17,236,114
Florida	136,793	131,691	268,484
Idaho	8,490,825	7,721,448	16,212,273
Kansas	75,214		75,214
Louisiana	62,619	38,397	101,016
Michigan	76,030		76,030
Minnesota	943,831		943,831
Mississippi	36,882		36,882
Missouri	923		923
Montana	10,804,819	8,260,302	19,065,121
Nebraska	179,961	12,397	192,358
Nevada	29,834,403	25,583,343	55,417,746
New Mexico	19,433,811	8,304,546	27,738,357
North Dakota	493,667		493,667
Oklahoma	42,177		42,177
Oregon	13,604,733	1,837,445	15,442,178
South Dakota	2,880,828	53,781	2,934,609
Utah	13,545,395	19,818,442	33,363,837
Washington	932,837	211,768	1,144,605
Wisconsin	6,758		6,758
Wyoming	28,789,965	2,140,004	30,929,969
Grand total	172,987,912	106,556,583	279,544,494

ALASKA.

The unappropriated lands in Alaska are not included herein. The total area of Alaska is 378,165,760 acres, of which about 20,898,000 acres are reserved. Approximately 300,000 acres have been surveyed under the rectangular system within the past five years.

REPORT OF THE COMMISSIONER OF PENSIONS.

COMMISSIONERS OF PENSIONS SINCE 1833.

Name.	By whom appointed.	Whence appointed.	Date of commission.
Edwards, James L	Jackson	Virginia	Mar. 3, 1833
Heath, James E	Fillmore	do	Nov. 27, 1850
Waldo, Loren P	Pierce	Connecticut	Mar. 17, 1853
Minot, Josiah	do	New Hampshire	Aug. 1, 1855
Whiting, George C	do	Virginia	Jan. 19, 1857
Barrett, Joseph H	Lincoln	Ohio	Apr. 15, 1861
Cox, Christopher C	Johnson	Maryland	July 28, 1868
Van Aernam, Henry	Grant	New York	May 1, 1869
Baker, James H	do	Minnesota	Apr. 20, 1871
Atkinson, Henry M	do	Nebraska	Mar. 26, 1875
Gill, Charles R	do	Wisconsin	Feb. 10, 1876
Bentley, John A	do	do	Mar. 28, 1876
Dudley, William W	Garfield	Indiana	June 27, 1881
Clarke, Otis P. G	Arthur	Rhode Island	Nov. 15, 1884
Black, John C	Cleveland	Illinois	Mar. 19, 1885
Tanner, James	Harrison	New York	Mar. 27, 1889
Raum, Green B	do	Illinois	Oct. 19, 1889
Lochren, William	Cleveland	Minnesota	Apr. 13, 1893
Murphy, Dominic I	do	Pennsylvania	May 28, 1896
Evans, Henry Clay	McKinley	Tennessee	Apr. 1, 1897
Ware, Eugene F	Roosevelt	Kansas	May 10, 1902
Warner, Vespasian	do	Illinois	Mar. 4, 1905
Davenport, James L	Taft	New Hampshire	Nov. 26, 1909
Saltzgaber, Gaylord M	Wilson	Ohio	May 20, 1913

REPORT OF THE COMMISSIONER OF PENSIONS.

WASHINGTON, D. C., *August 1, 1915.*

SIR: I bring to you herewith this annual report of the operations of the Bureau of Pensions for the fiscal year beginning July 1, 1914, and ending June 30, 1915.

GENERAL.

The tables appended hereto furnish all the statistical information usually inquired of by the committees and individuals of Congress and those of the public at large who have an interest in the matters with which they deal.

I have culled from them certain particular facts which are regarded as important, thus saving others the necessity of making search of the tables to procure knowledge thereof. The items follow:

FISCAL OPERATIONS.

There were paid out the following amounts:

Expenditures, fiscal years 1914 and 1915.

For pensions during the fiscal year:	
1914	$172,417,546.26
1915	165,518,266.14
For fees and expenses of examining surgeons:	
1914	103,519.45
1915	45,704.40
For field and special examinations:	
1914	109,305.97
1915	90,332.29
To pensioners in foreign countries:	
1914	1,034,071.88
1915	945,220.19
Total cost of administration:	
1914	2,066,507.15
1915	1,779,860.30

IMPORTANT FACTS.

The following data regarding the pension system are of interest:

Data regarding pension system.

Number of deaths:	
Civil War soldiers—	
1914	33,639
1915	33,255
Widows, etc., on the pension roll—	
1914	17,713
1915[1]	17,915
Estimated total number of original enlistments (individuals on the Union side during the Civil War)	2,213,365
Surviving soldiers, assuming that all are on the pension roll	396,370
Number of deaths	1,816,995
Changes of post-office addresses of pensioners:	
1914	128,024
1915	120,974
Employees at the beginning of the fiscal year:	
1914	1,420
1915	1,275
Old soldiers employed in the bureau:[2]	
1914	247
1915	249
Volumes in military library:	
1914	1,175
1915	1,300
Total pieces of mail handled in 1915:	
Incoming	1,340,796
Outgoing	3,997,868
Inclosures	1,513,232
Total pensioners on the roll June 30, 1914	785,239
Total pensioners on the roll June 30, 1915	748,147
Cases under act Mar. 3, 1899 (division of pension between husband and wife), 1915	2,657
Cases under act Aug. 8, 1882 (to wife where husband is insane), 1915	129
Cases under guardianship, 1915	9,466
Amount of fees paid to attorneys, 1915	$83,872.72

The Pension Office Building covers ground surface of 80,000 square feet, is 200 feet wide, 400 feet long, four stories high, has 176 rooms, has a great court in the center with a floor measurement (including side corridors) of 36,617 feet.

The total weight of all the papers and documents in the claims now on file on the fourth floor of the Pension Bureau is computed to be, in pounds, 1,464,000.

[1] This is the first year which shows a decrease in the number of widows on the roll, there being more deaths and remarriages than additions to the roll.

[2] This includes all classes, Civil War, Regular Establishment, and Spanish War.

In criminal cases for violation of pension laws there were 40 cases brought to trial in different courts in various parts of the United States during the year, in which there were 39 convictions and 1 acquittal.

FAMILY DATA CIRCULAR.

A circular was prepared with much care, seeking information indicated by inquiries therein. The purpose of it was to have in our records such information as would be valuable in the adjudication of claims both of the soldiers or sailors and widows, and in some cases of children. It also served to place on record an accurate history of the military or naval service of the soldier or sailor, and of his marital and family relations, so that for all time to come such data would remain here for appropriate use and historical reference.

This circular was sent to every male pensioner on the rolls. The nature of the inquiries is indicated below. A circular somewhat similar had been sent to male pensioners in 1898, and the matter in the replies proved very serviceable in the adjudication of claims, but over 16 years had elapsed since that date, during which, of course, many changes may have taken place. The inquiries in that circular were not sufficiently definite to bring out all of the material facts such as would be disclosed by the answers to this one. The old soldiers throughout the country had urged that something like this be done, and generally we had cordial cooperation in securing the information. From very many of them we have expressions of gratitude for undertaking this large task, which will remain of permanent benefit to them and their families.

The form sent out is as follows:

3—389

DEPARTMENT OF THE INTERIOR,
BUREAU OF PENSIONS,
Washington, D. C., January 2, 1915.

SIR: Please answer, at your earliest convenience, the questions enumerated below. The information is requested for future use, and it may be of great value to your widow or children. Use the inclosed envelope, which requires no stamp.

Very respectfully,

G. M. SALTZGABER, *Commissioner.*

No. 1. Date and place of birth? Answer.....
The names of organizations in which you served? Answer.....
.....
No. 2. What was your post office at enlistment? Answer.....
No. 3. State your wife's full name and her maiden name. Answer.....
No. 4. When, where, and by whom were you married? Answer.....
.....
No. 5. Is there any official or church record of your marriage? .....
If so, where? Answer.....

No. 6. Were you previously married? If so, state the name of your former wife, the date of the marriage, and the date and place of her death or divorce. If there was more than one previous marriage, let your answer include all former wives. Answer.....

.....

No. 7. If your present wife was married before her marriage to you, state the name of her former husband, the date of such marriage, and the date and place of his death or divorce, and state whether he ever rendered any military or naval service, and if so, give name of the organization in which he served. If she was married more than once before her marriage to you, let your answer include all former husbands. Answer.....

.....

No. 8. Are you now living with your wife, or has there been a separation? Answer

.....

No. 9. State the names and dates of birth of all your children, living or dead. Answer

.....

.....

.....

Date..... (Signature).....

This form of family data circular was mailed to each soldier, sailor, and marine on the pension roll on March 2, 1915. There were mailed to the pensioners 440,000 of these circulars and 349,091 were filled out and returned to the bureau during the fiscal year.

An actual count was made of 10,095 circulars to show exactly the statistics given below, it being presumed that the number of 10,000 would be a fair average of the whole number, and that the percentages thus obtained from them would, without much variance, hold good as to all.

The data contained in 10,095 circulars show the following:

Marital conditions of pensioners.

	Per cent.
Married prior to June 27, 1890	60.7
Married since June 27, 1890	8.9
Never married	3.4
Last wife divorced	1.0
Separated from wife	1.6
Wife dead	24.1

The total cost of printing, mailing, receiving, and filing these circulars, including clerk hire, for the year 1915, amounts to $15,814.97.

METAL BOXES FOR FILES.

There has been a change with respect to the method of caring for important papers filed in the very numerous cases in the Pension Bureau.

There are over 2,000,000 of such files, all placed in the upper story of the Pension Building. A large number of them are held together by a leather strap, about 50 of them being included in one bundle.

The price of the leather strap was being continually raised until we were compelled to pay 35 cents each for them, and we were informed that at the next purchase they would cost 45 cents. It was necessary to renew the strap every two years. In handling the bundles so strapped the files would be much worn and abraded, because the strap did not afford a sufficient support and protection the entire length of the bundle. The bundles were very difficult to handle by reason of the flexibility and insecure support of the strap.

Seeking some method to remedy the numerous difficulties in the old system, and to facilitate the handling of cases, our people finally hit upon a galvanized steel file box. We now have installed 2,900 of these boxes and 3,100 more are ordered. Unless restrained by some superior authority, we will continue to supply these steel file boxes as fast as the straps now holding the bundles wear out and it is necessary to replace them. The boxes are 6 inches in height, 27 inches in depth, and 4½ inches wide. They will hold from 40 to 80 cases, depending on the size, or 33 per cent more than were contained in the single bundles held by straps. The boxes cost us 37½ cents apiece, which is less than the cost of a strap.

Under the strap, when it was necessary to remove the files of one case, the entire bundle was drawn, placed on a table or rest, unstrapped, the case drawn, the bundle again strapped and placed on the shelf. Now by reason of the rigidity of the box, the same may be partially drawn and a case removed from any part of it and then the box shoved back. The handling is very much easier for the employees, thus enabling them to do better and more rapid work. The chief of the files estimates the labor saving at about 40 per cent. The boxes will endure permanently, while, as stated, the life of an average leather strap is only about two years. The saving in space we estimate at 26 per cent, thus decreasing the number of shelves, removing huge desks before required on which to place the strapped bundles, and thus allowing better ventilation and more sanitary care of the rooms where the files are kept and the employees compelled to work.

In addition to these advantages, the metal boxes afford better protection as against fire and the ravages of time. Last, but not least, the uniformly neat appearance of the boxes gives a touch of beauty and cleanliness to the rooms where they are stored.

Altogether the improvement is very excellent, and I thus call special attention to it, both because of its value and because, I have no doubt, there are many other places in the governmental departments where the same change would be beneficial and much appreciated.

CLEARANCE SECTION.

Last year I reported to you having inaugurated a system of accounting by which the exact status of the work of the bureau, day by day or at any given day, might be known. It made a constant check upon the work of all divisions and rendered it possible to present in definite form in my annual report reliable figures as to the work accomplished and that still pending for action.

Exhibit 23 shows complete information as to cases pending. The actual counts, with the comparative check of the daily bookkeeping, have been the most careful and most satisfactory ever made in the bureau, and the discrepancies are very small. Heretofore the counts have been largely haphazard by reason of the fact that there existed no ready means of testing the reliability thereof. Large variances between the actual and the required count were not reconciled.

The primary object of the clearance system has been achieved to my satisfaction. It has operated to remove some causes of duplication of work. It has aided examiners in handling claims. Fewer face-brief errors occur. Fewer consultations of section chiefs are necessary. It has secured equalization of work among the examiners. Each examiner receives a certain number of claims daily, known to be pending, whereas under the former plan one examiner might out of a bundle of ten cases get only two pending claims ready for the action of the Board of Review, and another examiner seven or eight; consequently charges of discrimination and favoritism were frequently made, which no longer occur. The distribution of claims and removal after action has been facilitated. There is no longer idleness awaiting distribution. The fact that the actual count on the 1st day of July, 1915, and succeeding days shows a discrepancy between the bookkeeping and the actual count of five in number is really marvelous, compared with the former experiences where the discrepancies ran up into the thousands.

We congratulate ourselves on having installed such an excellent system for keeping track of the files.

EMPLOYEES.

We began the year with 1,275 employees. This year the Congress by its appropriation required a reduction in number to the extent of 93, and that leaves us 1,182 employees. Acting under your benevolent instructions, vacancies occurring during the year caused by death, resignation, and transfer were not filled, so as to save dropping employees to satisfy the requirements of the law. Officers at department headquarters and bureau chiefs very kindly aided us in helping secure transfers, which made other vacancies. Altogether we had vacancies in number equal to the reduction required, but the vacancies

were not of the grades required, and, therefore, we were compelled to make demotions from one grade to another to accommodate the situation. There were 110 reductions, usually of one grade, but sometimes two transfers in grade.

By reason of the foregoing facts we were saved the sad necessity of dropping anybody from the service.

In this connection I desire to report that the employees in the bureau are busy at the tasks assigned to them; that they uniformly observe the rules of discipline prescribed by the department; that, as a whole, they are devoted to the interests of the Government committed to their care, loyal to superiors, and otherwise praiseworthy in their conduct.

Very respectfully,

G. M. SALTZGABER,
Commissioner.

The SECRETARY OF THE INTERIOR.

STATISTICAL TABLES.

EXHIBIT 1.—*Pensioners on the roll June 30, 1915, and June 30, 1914.*

	1915	1914	Gain.	Loss.
Regular Establishment:				
Invalids	15,242	14,919	323	.....
Widows	2,923	2,892	31	.....
Minor children	207	190	17	.....
Mothers	1,176	1,159	17	.....
Fathers	169	168	1	.....
Brothers, sisters, sons, and daughters	5	5	.....	.....
Helpless children	8	8	.....	.....
Civil War:				
Act May 11, 1912—				
Survivors	347,081	369,624	.....	22,543
Act Feb. 6, 1907—				
Survivors	2,872	7,158	.....	4,286
General law—				
Invalids	45,336	50,347	.....	5,011
Nurses	275	292	.....	17
Widows	54,131	56,819	.....	2,688
Minor children	167	184	.....	17
Mothers	627	825	.....	198
Fathers	65	98	.....	33
Brothers, sisters, sons, and daughters	420	353	67	.....
Helpless children	610	589	21	.....
Act June 27, 1890—				
Invalids	1,081	2,225	.....	1,144
Minor children	3,390	3,633	.....	243
Helpless children	464	458	6	.....
Act Apr. 19, 1908—				
Widows without children	231,852	232,084	.....	232
Widows with children	3,235	3,440	.....	205
War with Spain:				
Invalids	24,370	24,250	120	.....
Widows	1,284	1,241	43	.....
Minor children	191	221	.....	30
Mothers	2,668	2,763	.....	95
Fathers	392	428	.....	36
Brothers, sisters, sons, and daughters	3	3	.....	.....
Helpless children	4	4	.....	.....
War of 1812:				
Widows	134	170	.....	36
War with Mexico:				
Survivors	680	893	.....	213
Widows	4,253	4,699	.....	446
Indian wars:				
Survivors	786	915	.....	129
Widows	2,046	2,182	.....	136
Total	748,147	785,239	646	37,738

EXHIBIT 2.—*Pensioners added to and dropped from the roll at the beginning and at the close of the year, and the amount disbursed to each class of pensioners during the year ended June 30, 1915.*

Classes.	Number of pensioners at beginning of year.	Gains to the roll.			Gains to classes by transfer from other classes.				Losses to the roll by—					Losses to classes.	Number on roll at end of year.	Disbursements.
		Original.	Restoration.	Renewal.	Original.	Restoration.	Renewal.	Reissue.	Death.	Remarriage.	Limitation.	Failure to claim.	Other causes.			
Regular Establishment:																
Army—																
Invalids	11,185	551	1	4				2	341			26	19	17	11,340	$1,938,787.66
Widows, etc	2,874	201						1	114	31	9	6	3		2,913	570,103.80
Navy—																
Invalids	3,734	325	2	9					139			8	21		3,902	693,167.56
Widows, etc	1,548	110						1	57	20	4	2	1		1,575	333,832.54
Civil War:																
Act Feb. 6, 1907—																
Army	6,839	42	1				1	18	581			168	19	3,421	2,712	938,821.81
Navy	319	3							32			14	1	115	160	40,991.70
Act May 11, 1912—																
Army	357,754	432	2	11	1	1	20	6,686	27,112				39	1,705	336,051	91,878,417.42
Navy	11,870	46						178	1,025				2	37	11,080	2,901,642.26
General law—																
Army—																
Invalids	49,714	21	2	4		6	85	1,626	4,295			29	1	2,386	44,747	16,315,604.11
Nurses	292	3							19			1			275	42,602.93
Widows, etc	58,040	654	1	289			1	575	4,118	90	33	44	8	1	55,216	8,823,452.58
Navy—																
Invalids	633	3					1	33	60			1		20	589	204,696.92
Widows, etc	828	19		5				23	67	3		1			894	142,517.70
Act June 27, 1890—																
Army—																
Invalids	2,077	12	2						130			40	11	911	999	231,393.36
Minors, etc	3,947	336	2	6				1	15		587	10			3,730	750,048.05
Navy—																
Invalids	148	1							20			4		43	82	16,834.87
Minors, etc	144	11							1		30				124	26,067.79
Act Apr. 19, 1908—																
Army widows	226,614	13,069	5	5					12,183	411		180	38	577	226,304	33,055,844.92
Navy widows	8,910	412							491	10		12	2	24	8,783	1,299,835.01
War with Spain:																
Army—																
Invalids	23,512	452	4	11					293			20	29	1	23,636	3,000,621.95
Widows, etc	4,408	153		1					166	34	50	9	5	1	4,292	700,190.48

Navy—																
Invalids	738	11	1						13			1	2		734	105,185.79
Widows, etc	257	6		1					9	3	2				250	45,703.25
War of 1812:																
Widows	170								36						134	22,348.90
War with Mexico:																
Survivors	893								205			7		1	680	277,029.20
Widows	4,699	69	1	4					484	4		32			4,253	648,817.40
Indian wars:																
Survivors	915	6							133			2			786	199,772.96
Widows	2,182	66							190	2		10			2,046	313,933.22
Total	785,239	17,064	24	300	1	7	108	9,144	52,329	608	715	627	201	9,260	748,147	165,518,266.14

Amount disbursed on account of Regular Establishment	$3,535,891.56
Amount disbursed on account of Civil War	156,668,771.43
Amount disbursed on account of War with Spain	3,851,701.47
Amount disbursed on account of War of 1812	22,348.90
Amount disbursed on account of War with Mexico	925,846.60
Amount disbursed on account of Indian wars	513,706.18

EXHIBIT 3.—*Statement showing the number of pensioners in each class under the general pension laws and special acts of Congress, together with the annual value of each on the roll at the close of the fiscal year ended June 30, 1915.*

Classes.	General laws.		Special acts.	
	Number.	Annual value.	Number.	Annual value.
Invalids, Regular Establishment	14,909	$2,494,631.82	333	$79,236.00
Widows, etc., Regular Establishment	4,030	703,836.00	458	193,740.00
Survivors, act May 11, 1912	347,081	92,639,801.16		
Survivors, act Feb. 6, 1907	2,872	504,288.00		
Invalids, general law, Civil War	31,197	10,744,785.00	14,139	4,911,300.00
Nurses	211	30,384.00	64	11,112.00
Widows, etc., general law, Civil War	50,965	7,717,452.00	5,055	1,123,968.00
Invalids, act June 27, 1890	1,081	142,833.00		
Minors, etc., act June 27, 1890	3,854	608,568.00		
Widows, act Apr. 19, 1908	235,087	33,944,472.00		
Invalids, War with Spain	23,469	2,907,124.80	901	179,730.00
Widows, etc., War with Spain	4,243	638,116.00	209	65,768.00
Widows, War of 1812	128	18,432.00	6	1,536.00
Survivors, War with Mexico	663	236,004.00	17	6,264.00
Widows, War with Mexico	4,020	578,880.00	233	42,564.00
Survivors, Indian wars	710	167,136.00	76	13,560.00
Widows, Indian wars	1,979	284,976.00	67	10,944.00
Total	726,499	154,531,719.78	21,648	6,640,722.00

Total number of pensioners	748,147
Total annual value	$161,172,441.78
Average annual value of each pension:	
All classes	215.43
Regular Establishment	175.95
Act May 11, 1912	266.91
Act Feb. 6, 1907	175.59
General law, Civil War	241.45
Act June 27, 1890	170.50
Act Apr. 19, 1908	144.39
War with Spain	133.92
Survivors, Civil War	274.85

EXHIBIT 4.—*Pensioners and amounts paid, arranged by States, Territories, insular possessions, Canal Zone, and foreign countries, during the fiscal year ended June 30, 1915.*

	Number.	Amount.
STATES AND TERRITORIES.		
Alabama	2,949	$652,706.23
Alaska	73	16,243.82
Arizona	817	180,791.61
Arkansas	8,040	1,779,647.63
California	26,441	5,852,416.37
Colorado	7,347	1,626,280.65
Connecticut	9,132	2,021,195.34
Delaware	2,374	525,498.13
District of Columbia	8,203	1,815,721.57
Florida	4,042	1,027,358.89
Georgia	2,734	605,240.52
Idaho	2,049	453,561.21
Illinois	51,542	11,409,082.92
Indiana	45,613	10,096,919.78
Iowa	25,397	5,621,416.89
Kansas	29,582	6,543,877.69
Kentucky	19,491	4,313,894.54
Louisiana	4,902	1,085,593.49
Maine	13,018	2,881,484.94
Maryland	11,355	2,513,362.00
Massachusetts	31,143	6,893,418.56
Michigan	31,302	6,928,648.67
Minnesota	11,896	2,566,734.55
Mississippi	3,660	810,081.42
Missouri	36,031	7,975,940.97
Montana	2,158	477,610.51
Nebraska	13,113	2,902,369.85
Nevada	364	80,596.22
New Hampshire	5,488	1,325,453.54
New Jersey	18,813	4,164,685.43
New Mexico	1,731	383,101.01
New York	62,303	13,791,017.65
North Carolina	3,315	733,714.37
North Dakota	2,675	592,161.08
Ohio	70,768	15,666,677.11
Oklahoma	10,404	2,302,825.21
Oregon	7,119	1,575,650.56
Pennsylvania	69,011	15,275,745.00
Rhode Island	4,092	905,645.72
South Carolina	1,547	342,385.98
South Dakota	4,922	1,089,390.75
Tennessee	15,477	3,425,758.39
Texas	7,670	1,697,584.69
Utah	937	207,372.41
Vermont	5,970	1,321,445.32
Virginia	7,950	1,759,606.55
Washington	9,075	2,008,748.78
West Virginia	9,693	2,145,450.02
Wisconsin	18,053	3,995,758.81
Wyoming	766	169,610.80
Total	743,327	164,537,494.15
Canal Zone, total	1	240.00
INSULAR POSSESSIONS.		
Guam	2	504.00
Hawaii	69	15,189.03
Philippines	55	12,235.60
Porto Rico	33	7,383.17
Total	159	35,311.80
FOREIGN COUNTRIES.		
Algeria	1	5,208.92
Argentina	12	144.00
Australia	93	2,508.32
Austria-Hungary	32	20,400.18
Azores	5	$1,374.16
Bahamas	3	720.00
Barbadoes	2	330.00
Belgium	17	4,624.32
Bermuda	7	1,008.14
Bolivia	1	360.00
Brazil	6	1,344.25
British West Indies	9	2,142.37
Bulgaria	1	144.00
Canada	2,421	483,120.85
Cape de Verde Islands	1	96.00
Chile	11	3,006.23
China	16	2,906.04
Colombia	1	144.00
Comoro Islands	1	120.00
Costa Rica	3	768.00
Cuba	42	8,784.06
Danish West Indies	1	144.00
Denmark	46	9,360.62
Dominican Republic	2	348.00
Dutch West Indies	3	708.00
England	420	88,206.48
Egypt	1	144.00
Finland	8	1,620.50
France	63	14,331.54
Germany	427	85,314.86
Greece	10	1,368.19
Guatemala	3	708.00
Honduras	5	1,584.21
Hong Kong	2	375.00
India	10	1,788.46
Ireland	387	80,795.94
Isle of Pines	13	2,622.88
Italy	54	14,054.64
Japan	34	6,600.12
Liberia	6	1,296.54
Luxembourg	4	756.00
Malta	1	144.00
Mexico	53	9,978.75
Morocco	1	144.00
Netherlands	9	1,452.17
Newfoundland	5	876.48
New Zealand	17	3,624.91
Nicaragua	2	324.00
Norway	71	13,577.82
Panama	3	588.00
Peru	9	1,584.24
Portugal	4	792.00
Roumania	1	144.00
Russia	12	1,992.81
Samoa	1	96.00
Scotland	69	14,186.16
Servia	1	204.00
Seychelles Islands	1	144.00
Siam	1	180.00
South Africa	12	2,772.74
Spain	5	1,092.51
St. Helena	1	144.00
Sweden	76	15,140.88
Switzerland	70	14,874.72
Tasmania	1	276.00
Tonga Islands	1	216.00
Trinidad	2	372.00
Turkey in Asia	12	2,052.10
Turkey in Europe	2	330.00
Uruguay	2	504.00
Venezuela	1	144.00
Wales	30	5,886.08
Total	4,660	945,220.19

EXHIBIT 4.—*Pensioners and amounts paid, arranged by States, Territories, insular possessions, Canal Zone, and foreign countries, during the fiscal year ended June 30, 1915*—Continued.

SUMMARY.

	Pensioners.	Payments.
Pensioners residing in States and Territories and payments to them	743,327	$164,537,494.15
Pensioners residing in insular possessions and Canal Zone and payments to them	160	35,551.80
Pensioners residing in foreign countries and payments to them	4,660	945,220.19
Total	748,147	165,518,266.14

EXHIBIT 5.—*Pensioners of the different wars on the roll at the close of each of the last 5 fiscal years.*

	1915	1914	1913	1912	1911
Civil War	691,606	728,129	762,439	801,998	833,756
War with Spain	28,912	28,910	29,015	28,850	28,490
War of 1812	134	170	199	238	279
War with Mexico	4,933	5,592	6,265	6,846	7,631
Indian wars	2,832	3,097	3,396	3,649	4,016
Regular Establishment	19,730	19,341	18,958	18,713	17,986
Total	748,147	785,239	820,272	860,294	892,098

EXHIBIT 6.—*Comparative table of disbursements of pensions on account of the different wars for the last 5 years (cents omitted).*

	1915	1914	1913	1912	1911
Civil War	$156,668,771	$163,377,552	$164,897,872	$143,979,235	$148,231,686
War with Spain	3,851,701	3,907,510	4,071,168	3,971,086	3,961,261
War of 1812	22,349	27,532	32,171	37,819	44,247
War with Mexico	925,847	1,060,530	1,184,700	1,168,186	1,322,918
Indian wars	513,706	560,247	527,664	521,404	575,087
Regular Establishment	3,535,892	3,475,147	3,447,142	3,308,375	3,197,834
Total	165,518,266	172,408,518	174,160,717	152,986,105	157,328,103

EXHIBIT 7.—*Comparative table of the value of an average pension of the different wars for the last 5 fiscal years.*

	1915	1914	1913	1912	1911
Civil War	$226.53	$224.38	$216.29	$179.52	$177.78
War with Spain	133.22	135.16	140.31	137.64	138.68
War of 1812	166.71	161.96	161.66	158.90	158.94
War with Mexico	187.68	189.65	189.09	170.63	173.58
Indian wars	181.39	180.89	155.37	142.88	143.19
Regular Establishment	179.21	179.67	181.83	176.79	178.29
Average for all wars	179.12	178.62	174.09	161.06	161.75

EXHIBIT 8.—*Comparative number of pensioners on the roll at the close of each of the last 5 fiscal years, classified as to the character of pension received.*

	1915	1914	1913	1912	1911
DISABILITY PENSIONS.					
Civil War	45,611	50,347	62,125	103,599	113,469
War with Spain	24,370	24,250	24,160	23,841	23,383
Regular Establishment	15,242	14,919	14,561	14,373	13,757
Total	85,223	89,516	100,846	141,813	150,609
AGE AND SERVICE PENSIONS.					
Act May 11, 1912	347,081	369,624	379,064	13,246	.....
Act Feb. 6, 1907	2,872	7,158	16,241	333,579	356,830
Act June 27, 1890	1,081	2,225	5,274	47,201	59,991
War with Mexico	680	893	1,142	1,313	1,639
Indian wars	786	915	1,066	1,210	1,387
Total	352,500	380,815	402,787	396,549	419,847
DEPENDENTS.					
Civil War:					
General law	56,020	59,160	62,519	66,947	70,910
Act June 27, 1890	3,854	4,091	4,280	4,479	4,358
Act Apr. 19, 1908	235,087	235,524	232,864	232,947	228,198
Total	294,961	298,775	299,663	304,373	303,466
War with Spain	4,542	4,660	4,855	5,009	5,107
War of 1812	134	170	199	238	279
War with Mexico	4,253	4,699	5,123	5,533	5,982
Indian wars	2,046	2,182	2,330	2,439	2,629
Regular Establishment	4,488	4,422	4,397	4,340	4,179
Total	310,424	314,908	316,567	321,932	321,642
Grand total	748,147	785,239	820,200	860,294	892,098

EXHIBIT 9.—*Comparative disbursements during each of the last 5 years, classified as to the character of pension received.*

	1915	1914	1913	1912	1911
DISABILITY PENSIONS.					
Civil War	$16,562,903.96	$18,714,955.82	$25,825,094.29	$29,991,791.62	$31,870,611.69
War with Spain	3,105,807.74	3,132,372.53	3,240,844.86	3,130,991.22	3,110,900.63
Regular Establishment	2,631,955.22	2,581,190.51	2,560,379.27	2,433,074.20	2,358,731.34
Total	22,300,666.92	24,428,518.86	31,626,318.42	35,555,857.04	37,340,243.66
AGE AND SERVICE PENSIONS.					
Act of May 11, 1912	94,780,059.68	97,506,549.73	53,306,021.92	23,929.94	.....
Act of Feb. 6, 1907	979,813.51	2,000,203.23	36,376,470.53	61,346,240.53	61,708,892.07
Act of June 27, 1890	248,228.23	512,901.47	4,415,947.96	7,714,858.16	9,820,158.12
War with Mexico	277,029.20	354,799.79	411,416.35	341,756.88	428,221.22
Indian wars	199,772.96	225,664.88	176,292.72	148,853.04	168,688.24
Total	96,484,903.58	100,600,119.10	94,686,149.48	69,575,638.55	72,125,959.65
DEPENDENTS.					
Civil War:					
General law	8,965,970.28	9,463,517.57	10,017,900.81	10,507,286.10	11,123,496.98
Act of June 27, 1890	776,115.84	838,425.86	876,140.21	961,807.61	946,876.38
Act of Apr. 19, 1908	34,355,679.93	34,340,997.85	34,080,296.76	33,433,321.10	32,761,630.27
Total	44,097,766.05	44,642,941.28	44,974,337.78	44,902,414.81	44,832,003.63
War with Spain	745,893.73	775,137.00	830,323.56	840,094.83	840,350.62
War of 1812	22,348.90	27,532.40	32,171.07	37,819.20	44,347.45
War with Mexico	648,817.40	705,729.95	773,283.55	826,428.73	894,696.89
Indian wars	313,933.22	334,582.52	351,371.38	372,550.95	406,398.28
Regular Establishment	903,936.34	893,967.18	886,762.61	875,301.11	839,102.85
Total	46,732,695.64	47,379,890.33	47,848,249.95	47,854,619.63	47,856,899.72
Grand total	165,518,266.14	172,408,518.29	174,160,717.85	152,986,105.22	157,323,103.08

EXHIBIT 10.—*Amount paid to pensioners, 1790 to 1915, inclusive.*

War of the Revolution (estimated)	$70,000,000.00
War of 1812 (service pension)	45,972,895.76
Indian wars (service pension)	13,315,227.19
War with Mexico (service pension)	49,618,948.68
Civil War	4,614,643,267.43
War with Spain and Philippine insurrection	49,944,441.84
Regular Establishment	35,472,408.77
Unclassified	16,508,447.41
Total	4,895,475,637.08

EXHIBIT 11.—*Total amounts paid on account of pensions.*

Years.	Paid as pensions.	Cost of administration.	Total.	Number of pensioners.
1866 to 1914	$4,633,511,926.71	$127,938,472.79	$4,761,450,399.50	.....
1915	165,518,266.14	1,779,860.30	167,298,126.44	748,147
Grand total	4,799,030,192.85	129,718,333.09	4,928,748,525.94	.....

EXHIBIT 12.—*Loss and percentage of loss by death of Civil War soldiers, 1910 to 1915.*

Year.	On roll at beginning of year.	Loss by death during year.	Percentage of loss.
1910	593,961	35,312	5.9
1911	562,615	35,243	6.2
1912	529,884	33,981	6.3
1913	497,263	36,064	7.2
1914	462,379	33,639	7.3
1915	429,354	33,255	7.7

EXHIBIT 13.—*Comparative table of losses and gains to the roll for the last 5 years, classified by causes.*

	1915	1914	1913	1912	1911
Losses:					
By death	52,329	52,583	57,459	52,963	52,933
By remarriage	608	751	888	799	867
Minors attaining age of 16 years	715	773	983	929	870
Failure to claim for 3 years	627	248	202	295	287
Other causes	201	226	320	229	228
Total	54,480	54,581	59,852	55,115	55,185
Gains:					
By original allowance	17,064	19,198	19,276	22,712	26,490
Restoration and renewal	324	350	482	599	710
Total	17,388	19,548	19,758	23,311	26,200
Net loss	37,092	35,033	40,094	31,804	28,985

EXHIBIT 14.—*Comparative table of losses and gains to the roll for the last 5 fiscal years, classified by wars.*

	1915				1914				1913				1912				1911			
	Losses.	Gains.	Net loss.	Net gain.	Losses.	Gains.	Net loss.	Net gain.	Losses.	Gains.	Net loss.	Net gain.	Losses.	Gains.	Net loss.	Net gain.	Losses.	Gains.	Net loss.	Net gain.
Regular Establishment:																				
Army invalids	386	556	.....	170	413	572	.....	159	607	613	.....	6	366	726	.....	360	447	789	.....	342
Army dependents	163	201	.....	38	174	174	.....	.....	153	203	.....	50	131	234	.....	103	159	232	.....	73
Navy invalids	168	336	.....	168	201	400	.....	199	230	412	.....	182	169	425	.....	256	171	406	.....	235
Navy dependents	84	110	.....	26	77	102	.....	25	95	102	.....	7	95	153	.....	58	64	129	.....	65
Civil War:																				
Act May 11, 1912—																				
Army	27,151	445	26,706	.....	26,843	17,857	8,986	.....	14,912	369,298	.....	354,386	10	12,364	.....	12,354	.....	.....	.....	.....
Navy	1,027	46	981	.....	1,052	598	454	.....	544	11,976	.....	11,432	.....	892	.....	892	.....	.....	.....	.....
Act Feb. 6, 1907—																				
Army	768	43	725	.....	8,863	145	8,718	.....	306,873	605	306,268	.....	34,832	12,837	21,995	.....	25,247	19,933	5,314	.....
Navy	47	3	44	.....	408	43	365	.....	11,128	58	11,070	.....	1,771	515	1,256	.....	1,049	760	289	.....
General law—																				
Army invalids	4,325	27	4,298	.....	11,719	370	11,349	.....	43,462	2,339	41,123	.....	11,564	1,826	9,738	.....	12,311	3,834	8,477	.....
Army nurses	20	3	17	.....	34	1	33	.....	39	2	37	.....	44	.....	44	.....	42	6	36	.....
Army dependents	4,293	894	3,399	.....	4,458	780	3,678	.....	5,641	1,253	4,388	.....	5,021	1,126	3,895	.....	5,047	1,379	3,668	.....
Navy invalids	61	3	58	.....	112	8	104	.....	376	62	314	.....	128	40	88	.....	132	91	41	.....
Navy dependents	71	24	47	.....	54	9	45	.....	76	36	40	.....	74	6	68	.....	73	26	47	.....
Act June 27, 1890—																				
Army invalids	181	14	167	.....	2,900	41	2,859	.....	40,810	87	40,723	.....	12,439	148	12,291	.....	18,184	269	17,915	.....
Army dependents	612	394	218	.....	657	473	184	.....	700	509	191	.....	765	879	.....	114	715	727	.....	12
Navy invalids	24	1	23	.....	193	3	190	.....	1,216	12	1,204	.....	514	15	499	.....	718	23	695	.....
Navy dependents	31	11	20	.....	27	22	5	.....	22	14	8	.....	26	33	.....	7	26	28	.....	2
Act Apr. 19, 1908—																				
Army widows	12,812	13,079	.....	267	12,488	15,166	.....	2,678	13,778	13,842	.....	64	11,811	16,445	.....	4,634	10,653	17,859	.....	7,206
Navy widows	515	412	103	.....	493	475	18	.....	635	488	147	.....	451	566	.....	115	428	594	.....	166
War with Spain:																				
Army invalids	342	467	.....	125	290	383	.....	93	495	814	.....	319	396	849	.....	453	415	996	.....	581
Army nurses	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	3	.....	.....	.....	.....	.....	.....	.....	.....
Army dependents	264	154	110	.....	320	137	183	.....	330	182	148	.....	280	197	83	.....	222	222	.....	.....
Navy invalids	16	12	4	.....	17	14	3	.....	30	27	3	.....	21	26	.....	5	9	28	.....	19
Navy dependents	14	7	7	.....	17	5	12	.....	15	9	6	.....	22	7	15	.....	12	13	.....	1
War of 1812:																				
Widows	36	.....	36	.....	29	.....	29	.....	39	.....	39	.....	41	.....	41	.....	59	.....	59	.....
War with Mexico:																				
Survivors	212	.....	212	.....	256	7	249	.....	285	114	171	.....	330	4	326	.....	405	2	403	.....
Widows	520	74	446	.....	509	85	424	.....	526	116	410	.....	594	145	449	.....	584	207	377	.....
Indian wars:																				
Survivors	135	6	129	.....	159	8	151	.....	154	10	144	.....	184	7	177	.....	194	21	173	.....
Widows	202	66	136	.....	209	61	148	.....	185	76	109	.....	277	87	190	.....	308	115	193	.....
Total	54,480	17,388	37,092	.....	72,972	37,939	35,033	.....	443,356	403,262	40,094	.....	82,356	50,552	31,804	.....	77,674	48,689	28,985	.....

EXHIBIT 15.—*Appropriations for pensions and disbursements on account thereof for the fiscal year ended June 30, 1915, and unexpended balances at close of year.*

	Pensions.			Fees of examining surgeons, pensions.
	Army.	Navy.	Total.	
APPROPRIATIONS.				
Act of June 20, 1914	$162,500,000.00	$6,500,000.00	$169,000,000.00	$150,000.00
Repayments to the appropriations	51,124.11	2,106.11	53,230.22	
Total	162,551,124.11	6,502,106.11	169,053,230.22	150,000.00
DISBURSEMENTS.				
Amount disbursed by disbursing clerk, Bureau of Pensions	159,707,790.75	5,810,475.39	165,518,266.14	
Amount disbursed by chief disbursing clerk, Department of the Interior				45,704.40
Total amount disbursed	159,707,790.75	5,810,475.39	165,518,266.14	45,704.40
BALANCES.				
Remaining in the hands of the disbursing clerk, Bureau of Pensions, June 30, 1915	293,206.16	31,630.72	324,836.88	
Remaining in the hands of the chief disbursing clerk, Department of the Interior, June 30, 1915				29,295.60
Remaining in the United States Treasury June 30, 1915	2,550,127.20	660,000.00	3,210,127.20	75,000.00
Available balance June 30, 1915	2,843,333.36	691,630.72	3,534,964.08	104,295.60
Total	162,551,124.11	6,502,106.11	169,053,230.22	150,000.00

In addition to the above there were disbursed during the fiscal year ended June 30, 1915, the following sums, chargeable to the appropriation for the fiscal year ended June 30, 1914:

Fees of examining surgeons, pensions, by the chief disbursing clerk, Department of the Interior	$27,295.30
Fees of examining surgeons, pensions, by Treasury settlements	370.00
Total	27,665.30

Of the amount, $5,810,475.39, disbursed for Navy pensions $353,848.66 was paid from the Navy pension fund.

EXHIBIT 16.—*Number and amount of first payments in original, increase, restoration, and other cases made during the fiscal year June 30, 1915.*

Class.	Original.		Increase and reissue.		Supplemental.		Restoration and renewal.		Total.	
	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.
Regular Establishment:										
Army—										
Invalids	514	$57,726.92	347	$11,918.12			4	$114.00	865	$69,759.04
Widows, etc.	207	27,224.13	27	1,735.30	1	$1,055.13			235	30,014.56
Navy—										
Invalids	334	31,670.07	112	3,626.16			40	843.44	486	36,139.67
Widows, etc.	118	17,437.34	7	844.27					125	18,281.61
Civil War:										
Act May 11, 1912—										
Army	426	73,890.32	64,391	2,819,970.56	14	568.53	16	2,295.92	64,847	2,896,725.33
Navy	49	7,788.29	2,149	93,465.91	1	1,092.60	1	226.60	2,200	102,573.40
Act Feb. 6, 1907—										
Army	30	16,181.67	9	901.50	1	507.80	2	1,518.50	42	19,109.47
Navy	1	625.50			2	498.20			3	1,123.70
General law—										
Army—										
Invalids	20	534.90	2,573	133,274.72	6	5,092.73	25	7,636.20	2,624	146,538.55
Nurses	3	106.00	6	240.27					9	346.27
Widows, etc.	634	56,556.30	757	25,429.58	1	37.83	213	18,645.52	1,605	100,669.23
Navy—										
Invalids	3	118.00	82	4,232.87					85	4,350.87
Widows, etc.	19	1,054.60	26	1,091.59			8	1,916.80	53	4,062.99
Act June 27, 1890—										
Army—										
Invalids	10	10,081.94	4	2,509.20	5	5,479.67	4	4,183.60	23	22,254.41
Minors, etc.	384	93,291.54	5	383.36	1	179.86	9	1,106.19	399	94,960.95
Navy—										
Invalids	1	119.20					1	914.80	2	1,034.00
Minors, etc.	13	2,409.12							13	2,409.12
Act Apr. 19, 1908—										
Army widows	12,178	761,938.06	24	2,514.36	4	4,618.60	5	589.73	12,211	769,660.75
Navy widows	409	29,210.24			1	2,053.33	1	1,275.87	411	32,539.44
War with Spain:										
Army—										
Invalids	467	73,456.29	457	12,423.23			10	935.00	934	86,814.52
Widows, etc.	154	25,503.06	4	92.20			1	23.20	159	25,618.46
Navy—										
Invalids	11	1,032.73	17	447.24			1	72.00	29	1,551.97
Widows, etc.	5	193.60					2	59.20	7	252.80
War of 1812:										
Widows			1	67.60					1	67.60

EXHIBIT 16.—*Number and amount of first payments in original, increase, restoration, and other cases made during the fiscal year June 30, 1915*—Continued.

Class.	Original.		Increase and reissue.		Supplemental.		Restoration and renewal.		Total.	
	umber.	Amount.	Number.	Amount.	Number.	Amount,	Number.	Amount.	Number.	Amount.
War with Mexico:										
Survivors			8	$776.13					8	$776.13
Widows	71	$12,593.41	61	2,390.46	2	$85.60	3	$354.20	137	15,423.67
Indian wars:										
Survivors	7	6,161.95	28	2,482.60					35	8,644.55
Widows	59	11,334.73	12	393.88			1	756.00	72	12,484.61
Total	16,127	1,318,239.91	71,107	3,121,211.11	39	21,269.88	347	43,466.77	87,620	4,504,187.67

AVERAGE VALUE OF FIRST PAYMENTS: 1915.

In original cases	$81.74
In original regular establishment cases	114.29
In original act of May 11, 1912, cases	171.95
In original act of Feb. 6, 1907, cases	542.17
In original general law, Civil War cases	85.96
In original act June 27, 1890, cases	259.56
In original act of Apr. 19, 1908, cases	62.85
In original War with Spain cases	157.28
In original War with Mexico cases	177.37
In original Indian wars cases	265.10
In increase and reissue cases	43.89

EXHIBIT 17.—*Statement showing number of inmates and amount paid the Soldiers' Homes and the Hospital for the Insane from July 1, 1914, to June 30, 1915.*

Branch and location.	July 1, 1914, to Sept. 30, 1914.		Oct. 1, 1914, to Dec. 31, 1914.		Jan. 1, 1915, to Mar. 31, 1915.		Apr. 1, 1915, to June 30, 1915.		Total.
	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.	
Battle Mountain Sanitarium, Hot Springs, S. Dak	348	$21,768.85	407	$24,540.02	390	$25,188.38	330	$20,744.72	$92,241.97
Central, National Military Home, Ohio	3,303	200,711.42	3,269	199,880.85	3,258	198,951.53	3,175	195,199.57	794,743.37
Danville, National Home, Danville, Ill	2,098	126,853.69	2,233	132,590.36	2,278	136,511.46	2,072	125,833.48	521,788.99
Eastern, National Soldiers' Home, Me	1,419	88,786.31	1,401	87,548.80	1,371	85,453.62	1,304	81,430.04	343,218.77
Government Hospital for Insane, Washington, D. C	355	21,047.54	354	24,846.16	352	26,094.80	357	21,937.41	93,925.91
Marion, National Military Home, Ind	1,349	82,272.66	1,398	85,183.31	1,433	86,919.45	1,341	83,135.56	337,510.98
Mountain, National Soldiers' Home, Tenn	1,232	74,264.18	1,302	78,115.14	1,339	80,650.78	1,236	74,101.41	307,131.51
Northwestern, National Home, Wis	1,521	92,795.35	1,565	94,522.09	1,540	94,247.25	1,467	91,037.48	372,602.17
Pacific, Soldiers' Home, Cal	3,061	192,360.40	3,158	199,529.30	3,184	202,922.37	3,050	195,570.80	790,382.87
Southern, National Soldiers' Home, Va	2,041	123,214.04	2,086	126,549.80	2,056	125,896.57	2,018	123,941.07	499,601.48
United States Soldiers' Home, Washington, D. C	998	57,472.97	1,074	62,584.93	1,127	64,721.72	1,073	62,190.35	246,969.97
Western, National Military Home, Kans	2,470	150,993.59	2,643	162,311.97	2,673	163,597.44	2,492	153,359.59	630,262.59
Total	20,195	1,232,541.00	20,890	1,278,202.73	21,001	1,291,155.37	19,915	1,228,481.48	5,030,380.58

Total amount of attorney fees paid in cases where the pensioners were inmates of the above homes during the fiscal year ended June 30, 1915, was $945.00, making the entire disbursement on account of homes $5,031,325.58.

EXHIBIT 18.—*Report of certificates issued during the fiscal year ended June 30, 1915.*

Classes.	Original.	Increase.	Additional.	Reissue.	Restoration.	Renewal.	Supplemental.	Total.
General law:								
Army—								
Invalids	21	1,051	.....	1,588	9	100	5	2,774
Nurses	3	5	.....	.....	.....	.....	.....	8
Widows, etc	648	204	.....	642	1	245	4	1,744
Navy—								
Invalids	2	19	.....	25	.....	1	.....	47
Widows, etc	21	4	.....	20	.....	4	.....	49
Old wars—								
Invalids	1	1	.....	.....	.....	.....	.....	2
Widows, etc	1	2	.....	.....	.....	.....	.....	3
1812 widows	.....	2	.....	.....	.....	.....	.....	2
War with Spain—								
Army—								
Invalids	455	428	.....	19	4	11	.....	917
Nurses	3	.....	.....	.....	.....	.....	.....	3
Widows, etc	157	4	.....	2	.....	1	.....	164
Navy—								
Invalids	9	16	.....	3	.....	.....	1	29
Widows, etc	5	1	.....	.....	.....	2	.....	8
Regular Establishment—								
Army—								
Invalids	547	354	.....	26	1	5	.....	933
Nurses	1	.....	.....	.....	.....	.....	.....	1
Widows, etc	202	21	.....	7	.....	.....	1	231
Navy—								
Invalids [1]	354	100	.....	32	11	29	1	527
Widows, etc	115	5	.....	4	.....	.....	1	125
Act of June 27, 1890:								
Army—								
Invalids	12	1	.....	1	2	.....	10	26
Widows, etc	449	3	.....	11	3	6	9	481
Navy—								
Invalids	2	.....	.....	.....	.....	.....	1	3
Widows, etc	12	.....	.....	.....	.....	1	1	14
Act of Feb. 6, 1907:								
Army, Civil War	43	12	.....	25	.....	.....	22	102
Navy, Civil War	3	2	.....	.....	1	.....	1	7
Survivors, Mexican War	.....	.....	.....	.....	.....	.....	.....	.....
Act of Apr. 19, 1908:								
Army widows	13,007	4	.....	30	3	5	.....	13,049
Navy widows	416	.....	.....	.....	.....	.....	.....	416
Act of May 11, 1912:								
Army, Civil War	435	42,179	.....	7,629	8	37	56	50,344
Navy, Civil War	46	1,374	.....	209	.....	1	.....	1,630
Survivors, Mexican War	.....	3	.....	.....	.....	.....	.....	3
War with Mexico, act 1887, etc.:								
Survivors	.....	1	.....	4	1	.....	.....	6
Widows	70	67	.....	.....	1	3	.....	141
Indian wars:								
Survivors	7	31	.....	.....	.....	.....	.....	38
Widows	65	11	.....	.....	1	.....	.....	77
Total	17,112	45,905	.....	10,277	46	451	113	73,904
Reissue in lieu of lost certificates	.....	.....	.....	.....	.....	.....	.....	6,526
Accrued orders	.....	.....	.....	.....	.....	.....	.....	14,774
Grand total	.....	.....	.....	.....	.....	.....	.....	95,203

[1] 22 concurrent originals.

EXHIBIT 19.—*Statement showing by classes the different monthly rates paid to pensioners under the general pension laws and the number at each rate on the roll June 30, 1915.*

Rate.	Regular Establishment.		Civil War.							War with Spain.	
					General law.		Act June 27, 1890.		Act Apr. 19, 1908.		
	Invalids.	Widows, etc.	Act May 11, 1912.	Act Feb. 6, 1907.	Invalids.	Widows, etc.	Invalids.	Minors, etc.	Widows.	Invalids.	Widows, etc.
$2.00	2										
2.00	5										
4.00	2										
5.00	7										
6.00	4,180				296		56			9,785	
6.25										5	
7.50	17				5					36	
8.00	2,151				170		138	9		4,211	
8.50	1				4					33	
9.00	1									1	
9.50	2										
10.00	1,520				148		102			2,770	
10.50	1										
11.00	1										
11.25					2					27	
11.50	2										
12.00	1,710	3,312		1,617	322	46,740	783	3,845	235,087	2,343	4,030
12.50	12				1					8	
12.75	1				4					41	
13.00	3		1,100		6						
13.50			2,163		1						
14.00	631		1,275		378					912	
14.50			862							1	
15.00	42	47	12,504	492	26	951				86	28
15.50			20,867								
15.54	1										
15.68	1										
16.00	98		14,117		247					39	
16.50			12,083							1	
16.68	1										
17.00	1,724	114	5,731		3,995	1,452				1,618	57
17.44½	1										
17.50	8										
17.86	1										
18.00	15		18,776		21					2	
18.18	1										
18.50	2		1								
18.75			1		1					4	
19.00	2		32,128								
19.18	2										
19.50	2										
19.68	1										
19.75							1				
19.84½	1										
20.00	74	190	17,008	762	412	1,308				120	74
20.36	1										
20.50	3										
20.68	3										
21.00	1		9,415								
21.25	15									1	
21.29½	1										
21.50			15,402								
21.68	1										
22.00	64				420					52	
22.50	2		18,725							2	
22.59½	1										
22.68	2										
22.75	1										
22.94½	1										
23.00	1		10,393								
23.14½	1										
23.49½	1										
23.68	1										
23.86	1										
24.00	966		40,625		9,257					592	
24.18	1										
24.50			1								
25.00	72	130	46,339		649	296				24	34
25.50	1										

EXHIBIT 19.—*Statement showing by classes the different monthly rates paid to pensioners under the general pension laws and the number at each rate on the roll June 30, 1915*—Continued.

Rate.	Regular Establishment.		Civil War.							War with Spain.	
	Invalids.	Widows, etc.	Act May 11, 1912.	Act Feb. 6, 1907.	General law.		Act June 27, 1890.		Act Apr. 19, 1908.	Invalids.	Widows, etc.
					Invalids.	Widows, etc.	Invalids.	Minors, etc.	Widows.		
$25.69½	1										
25.75	1										
26.00	2		1							1	
26.24½	1										
26.36	1										
26.64	1										
26.69½	1										
26.99½	1										
27.00	25		8,717		442		1			19	
27.19	1										
27.36	2										
27.50	3		2		1					1	
27.89½	1										
28.00	1		2								
28.25	1										
28.50	1										
28.68	1										
29.00										1	
29.18	2									1	
29.36	1										
29.75			1								
29.84½	1										
29.94	1										
30.00	822	237	58,811		9,259	215				425	20
30.49	2										
30.50	1										
30.68	1										
31.00	1										
31.04	1										
31.18	1										
31.25	1				6						
31.50	1										
31.68			1								
32.00	1										
32.18										1	
32.36	1										
32.50	1										
32.68	1										
32.94½	1										
33.00	2		1								
33.50	1										
34.00	1		1								
34.18	1										
34.25	2										
34.44½	1										
34.50	3		1								
34.64½	1										
34.86	1										
35.00	1		7								
35.50	2										
35.68	3										
36.00	6				37	1				1	
36.09½	1										
36.18	2										
36.50	1		1								
36.59½	1										
36.64½	1										
36.89½	1										
37.00	1										
37.18										1	
37.19½	1										
37.36	1										
37.50	9		2								
37.68	2										
37.86	1										
38.00	1										
38.36	1										

EXHIBIT 19.—*Statement showing by classes the different monthly rates paid to pensioners under the general pension laws and the number at each rate on the roll June 30, 1915*—Continued.

Rate.	Regular Establishment.		Civil War.							War with Spain.	
	Invalids.	Widows, etc.	Act May 11, 1913.	Act Feb. 6, 1907.	General law.		Act June 27, 1890.		Act Apr. 19, 1909.	Invalids.	Widows, etc.
					Invalids.	Widows, etc.	Invalids.	Minors, etc.	Widows.		
$38.50			1								
39.00			1								
39.25	1										
40.00	178				1,751					94	
40.50	1		1								
40.54½	1										
40.68	1										
40.74½	1										
41.00	3		1								
41.50			2								
41.64½				1							
41.68	1										
42.00	2										
42.09½	1										
42.50			1								
42.68	1										
43.00			1								
43.50	1		1								
43.69											
44.00	2										
44.36	1										
44.59	1										
44.86	1										
45.00					3						
45.14½	1										
45.50	1										
45.89	2										
46.00	91		1		920					58	
46.18	1										
46.44	5										
46.50	1										
46.99	2										
47.00	2										
47.25	1										
47.50			1								
48.00	3				1						
48.25			1								
48.78	1										
48.86										1	
50.00	108				719	1				63	
50.50			1								
51.50	1										
52.00	2										
52.09½	1										
52.44	1										
52.59½	2										
53.50			1								
53.54	1										
53.64½	1										
53.89	1										
54.00	1										
55.00	38				1,016					27	
55.19	1										
55.50			1								
56.00	1										
57.50	1										
58.00	1										
58.50	1										
59.00	1				1						
59.50			1								
60.00	2										
60.49½	1										
61.04½	1										
62.36	1										
62.69½	1										
62.86	1										
63.00	1										

EXHIBIT 19.—*Statement showing by classes the different monthly rates paid to pensioners under the general pension laws and the number at each rate on the roll June 30, 1915*—Continued.

Rate.	Regular Establishment.		Civil War.							War with Spain.	
	Invalids.	Widows, etc.	Act May 11, 1912.	Act Feb. 6, 1907.	General law.		Act June 27, 1890.		Act Apr. 19, 1908.	Invalids.	Widows, etc.
					Invalids.	Widows, etc.	Invalids.	Minors, etc.	Widows.		
$63.44	1										
63.50			1								
71.14½	1										
71.89½	1										
72.00	75				339	1				48	
74.04½	1										
74.09½	1										
80.00	2										
82.50	1										
100.00	43				337					12	
108.00										1	
117.14½	1										
Total.	14,909	4,030	347,081	2,872	31,197	50,965	1,081	3,854	235,087	23,469	4,243

In addition to the above, there were at the close of the year:

Army nurses, 211, at $12.

War of 1812 widows, 128, at $12.

War with Mexico, survivors—1 at $12; 1 at $15; 19, at $20; 642, at $30. Widows—4,020, at $12.

Indian wars, survivors—1 at $8; 27, at $12; 11, at $16; 671, at $20. Widows—1,979, at $12.

EXHIBIT 20.—*Statement showing by classes the different monthly rates paid to pensioners under special acts of Congress and the number at each rate on the roll June 30, 1915.*

Rate.	Regular Establishment		Civil War.			War with Spain.		War of 1812.	War with Mexico.		Indian wars.	
	Invalids.	Widows, etc.	Invalids.	Nurses.	Widows, etc.	Invalids.	Widows, etc.	Widows.	Survivors.	Widows.	Survivors.	Widows.
$6.00	5	.....	5	.....	.....	18	1	.....	.....	.....	.....	.....
8.00	9	.....	17	.....	9	37	1	.....	.....	1	12	.....
10.00	9	.....	11	.....	2	41	.....	.....	.....	.....	.....	.....
12.00	121	121	268	50	2,404	420	188	1	1	147	2	54
12.50	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....
14.00	5	.....	7	.....	5	9	.....	.....	.....	.....	.....	.....
15.00	5	3	15	.....	62	29	4	.....	.....	1	.....	.....
15.50	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
16.00	10	1	4	.....	142	13	.....	.....	.....	8	60	.....
17.00	21	5	25	.....	100	84	5	.....	.....	.....	.....	.....
17.50	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
18.00	4	3	5	.....	38	7	.....	.....	.....	1	.....	.....
20.00	30	25	305	6	1,631	56	20	1	2	66	1	12
21.00	.....	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....
22.00	.....	1	1	.....	.....	2	.....	.....	.....	.....	.....	.....
22.50	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....
24.00	44	4	4,894	5	248	74	1	4	.....	1	.....	1
25.00	.....	44	12	2	125	3	26	.....	.....	2	.....	.....
27.00	.....	.....	31	.....	1	.....	.....	.....	.....	.....	.....	.....
28.00	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
30.00	41	78	6,427	.....	191	77	19	.....	10	3	1	.....
32.00	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
35.00	.....	28	.....	.....	12	.....	6	.....	.....	.....	.....	.....
36.00	2	.....	834	1	7	2	.....	.....	.....	.....	.....	.....
40.00	8	64	710	.....	21	7	13	.....	3	2	.....	.....
45.00	1	1	19	.....	1	.....	.....	.....	.....	.....	.....	.....
46.00	2	.....	14	.....	.....	4	.....	.....	.....	.....	.....	.....
50.00	13	71	452	.....	44	14	14	.....	1	1	.....	.....
55.00	.....	.....	18	.....	.....	1	.....	.....	.....	.....	.....	.....
60.00	1	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....
65.00	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....
67.00	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
72.00	1	.....	22	.....	.....	1	1	.....	.....	.....	.....	.....
75.00	.....	1	.....	.....	3	.....	.....	.....	.....	.....	.....	.....
100.00	.....	6	13	.....	6	1	.....	.....	.....	.....	.....	.....
125.00	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
166.66⅔	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
208.33⅓	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
416.66⅔	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
Total	333	458	14,139	64	5,055	901	299	6	17	233	76	67

EXHIBIT 21.—*Total number of certificates issued on account of all claims allowed since the establishment of the pension system (to include June 30, 1915).*

Original soldiers' and sailors' claims allowed:		
Revolutionary War		52,504
War of 1812		25,723
Mexican War		20,665
Indian wars		6,447
Old war, prior to Mar. 4, 1861		9,486
Army, since Mar. 4, 1861 (exclusive of War with Spain)		1,134,036
Navy, since Mar. 4, 1861 (exclusive of War with Spain)		43,735
War with Spain—		
Army	30,004	
Navy	1,073	
		31,077
Total		1,323,673

Reissues and increases:			
Revolutionary War		2,992	
Mexican War (approximated)		20,676	
Indian Wars (approximated)		629	
Army (approximated and exclusive of War with Spain)		3,556,611	
Navy (approximated and exclusive of War with Spain)		128,299	
War with Spain—			
Army	14,527		
Navy	411		
		14,938	
			3,724,145
Total			5,047,818
Original widow claims allowed:			
Revolutionary War—			
Widows			22,644
Daughters (special acts)			18
War of 1812			35,520
Mexican War			16,095
Indian War			8,240
Old war, prior to Mar. 4, 1861			8,038
Army, since Mar. 4, 1861 (exclusive of War with Spain)			782,137
Navy, since Mar. 4, 1861 (exclusive of War with Spain)			24,449
War with Spain—			
Army		7,381	
Navy		416	
			7,797
Total			904,938
Reissue and increase claims allowed:			
Widows, War with Spain (Navy, 27; Army, 197)		224	
Widows, act Mar. 3, 1901 (approximated)		11,950	
Widows, all other acts (approximated)		51,104	
			63,278
Total			968,216
Approximated number of issues on account of all claims allowed:			
Soldiers and sailors			5,047,818
Widows			968,216
Total			6,016,034

EXHIBIT 22.—*Special acts.*

Since 1861 there have been allowed by special acts of Congress 47,398 pensions and increases of pensions, of which 21,648 are now on the roll, with an annual face value of $6,640,722. Only a part of this is properly chargeable to special acts, as most of the beneficiaries had been previously pensioned under general laws at lower rates.

From June 30, 1914, and thereafter during the Sixty-third Congress, 4,167 persons were included in the special acts passed at the rates specified in the summary following:

Pensions granted by special act during the Sixty-third Congress subsequent to June 30, 1914.

Rates specified.	Number granted.	Rates specified.	Number granted.
$100.00	1	$15.00	4
72.00	2	14.00	3
50.00	243	12.00	819
45.00	2	10.00	6
40.00	297	8.00	7
36.00	349	Inoperative:	
35.00	1	$50.00	15
30.00	962	40.00	13
27.00	32	36.00	12
25.00	16	30.00	36
24.00	459	27.00	1
22.50	6	25.00	1
21.00	16	24.00	14
20.00	730	20.00	17
18.00	4	17.00	2
17.00	83	12.00	11
16.00	2		
15.50	1	Total	4,167

Of the above, 918 were granted to persons not in receipt of a pension and 3,249 to persons then receiving smaller pensions.

The annual value of said special-act pensions is $1,257,006, and the annual increase due to the same is $552,507.

The following statement shows the number of pensions and increases of pensions granted by special acts during each Congress since March 4, 1861.

Number of pensions granted by special acts each Congress since Mar. 4, 1861.

Thirty-seventh (1861–1863)	12	Fifty-second (1891–1893)	217
Thirty-eighth (1863–1865)	27	Fifty-third (1893–1895)	119
Thirty-ninth (1865–1867)	138	Fifty-fourth (1895–1897)	378
Fortieth (1867–1869)	275	Fifty-fifth (1897–1899)	694
Forty-first (1869–1871)	85	Fifty-sixth (1899–1901)	1,391
Forty-second (1871–1873)	167	Fifty-seventh (1901–1903)	2,171
Forty-third (1873–1875)	182	Fifty-eighth (1903–1905)	3,355
Forty-fourth (1875–1877)	98	Fifty-ninth (1905–1907)	6,030
Forty-fifth (1877–1879)	230	Sixtieth (1907–1909)	6,600
Forty-sixth (1879–1881)	96	Sixty-first (1909–1911)	9,649
Forty-seventh (1881–1883)	216	Sixty-second (1911–1913)	6,350
Forty-eighth (1883–1885)	598	Sixty-third (1913–1915)	5,061
Forty-ninth (1885–1887)	856		
Fiftieth (1887–1889)	1,015	Total	47,398
Fifty-first (1889–1891)	1,388		

EXHIBIT 23.—*Classification of claims pending June 30, 1915.*

	Invalid.				Widows and dependents.			Service pensions.		
	Total.	Original.	Reissue.	Increase.	Original.	Reissue.	Increase.	Original.	Reissue.	Increase.
Civil War:										
General law	2,543	64	104	1,347	999	15	10	4	.....	.....
Act June 27, 1890	1,110	.....	.....	.....	978	.....	39	69	11	13
Act Mar. 3, 1901	182	.....	.....	.....	182	.....	.....	.....	.....	.....
Act. Feb. 6, 1907	88	.....	.....	.....	.....	.....	.....	60	22	6
Act May 11, 1912	8,757	.....	.....	.....	.....	.....	.....	695	1,567	6,495
Act Apr. 19, 1908	8,132	.....	.....	.....	8,129	.....	3	.....	.....	.....
Total, Civil War	20,812	64	104	1,347	10,288	15	52	828	1,600	6,514
Regular Establishment	4,256	2,910	.....	826	512	.....	.....	8	.....	.....
War with Spain	5,880	4,409	.....	1,089	382	.....	.....	.....	.....	.....
Mexican War	89	.....	.....	.....	86	.....	.....	3	.....	.....
Indian wars	68	.....	.....	.....	52	.....	.....	16	.....	.....
Old wars	1	.....	.....	.....	1	.....	.....	.....	.....	.....
Bounty land	6	.....	.....	.....	.....	.....	.....	4	2	.....
Grand total	31,112	7,383	104	3,262	11,321	15	52	859	1,602	6,514

Special acts:	
Widows	5
Minors	2
Act of Mar. 3, 1899—deserted wives	284
Act of Mar. 2, 1895:	
Accrued	11,317
Reimbursement	1,290
Cases before Board of Pension Appeals	920
Cases before Pension Committees of Congress	416

EXHIBIT 24.—*Applications received during the fiscal year ended June 30, 1915.*

	Original.	Increase.	Restoration.	Total.
General law:				
Civil War—				
Invalids	120	3,354	283	3,757
Dependents	2,028	.....	16	2,044
War with Spain—				
Invalids	2,369	906	36	3,311
Dependents	381	.....	3	384
Regular Establishment—				
Invalids	3,812	2,216	27	6,055
Dependents	717	.....	.....	717
War with Mexico:				
Survivors	3	.....	.....	3
Dependents	108	.....	1	109
Indian wars:				
Survivors	36	.....	.....	36
Dependents	76	.....	.....	76
Bounty land:				
Survivors	4	.....	.....	4
Dependents	6	.....	.....	6
Act May 11, 1912, Civil War	32,068	493	.....	32,561
Act Apr. 19, 1908	17,029	.....	.....	17,029
Act June 27, 1890:				
Invalids	.....	.....	3	3
Dependents	665	.....	3	668
Act Mar. 3, 1899	763	.....	.....	763
Acts Mar. 3, 1901, and Feb. 28, 1903	394	.....	.....	394
Act Aug. 2, 1892, nurses	14	.....	.....	14
Act Aug. 8, 1882	41	.....	.....	41
Accrued	5,194	.....	.....	5,194
Arrears	50	.....	.....	50
Reimbursement	7,643	.....	.....	7,643
Total	73,521	6,969	372	80,862

EXHIBIT 25.—*Statistics of operations under act of Mar. 3, 1899.*

Since the passage of the act of March 3, 1899, providing for the division of pension of resident pensioners of the United States who desert their wives and children, or who are inmates of National or State Soldiers' and Sailors' Homes, 15,718 claims have been filed thereunder, 8,753 of which have been allowed and 6,713 rejected.

On July 1, 1914, there were 246 claims pending. During the year 537 claims were filed or renewed; 346 claims were admitted and 183 rejected, leaving 254 claims pending on June 30, 1915.

EXHIBIT 26.—*Revolutionary archives.*

Total pension claims on file:	
Admitted	72,284
Rejected	10,319
Bounty land claims	8,843
Calls at bureau for examination of records, 1915	635
Certificates of service furnished, 1915	2,349
Negative replies given, 1915	3,587
Answers, miscellaneous matters, 1915	1,184
Claims drawn from files and considered, 1915	12,672
Words in copies given, 1915	20,540

EXHIBIT 27.—*Carding of records.*

State record cards written	14,279	
Numerical cards written (completed)	47,957	
Alphabetical cards written	17,316	
Total completed cards written		79,552
Cards canceled by consolidation and correction		41,958
Net total completed cards written		37,594
Incomplete numerical cards written		35,482
Record books carded		8
Grand total carded to June 30, 1915:		
State record cards	2,474,268	
Numerical cards (completed)	418,149	
Alphabetical cards	2,687,037	
Grand total completed cards written		5,579,454
Cards canceled by consolidation and correction		313,425
Grand total completed cards on file		5,266,029
Incomplete numerical cards		321,341
Total number of record books carded		629
Act May 11, 1912:		
Cards filed—		
Original		7,401
Increase		42,254
Cards stamped "Dead"		27,341
Cards canceled		43,148
Total on file		421,136

EXHIBIT 28.—*Examining surgeons for the Bureau of Pensions, showing States in which they are located, June 30, 1915.*

States.	Boards.	Single surgeons.	Experts.	States.	Boards.	Single surgeons.	Experts.
Alabama	9	.....	7	Nebraska	46	6	7
Arizona	1	2	2	Nevada	3	.....	.....
Arkansas	19	6	8	New Hampshire	12	.....	2
California	19	4	20	New Jersey	10	.....	2
Colorado	18	6	11	New Mexico	3	7	3
Connecticut	9	1	7	New York	62	.....	31
Delaware	3	.....	.....	North Carolina	13	8	9
District of Columbia	3	.....	9	North Dakota	4	1	5
Florida	8	1	7	Ohio	90	2	37
Georgia	7	4	12	Oklahoma	35	1	13
Idaho	5	4	3	Oregon	14	4	9
Illinois	92	.....	33	Pennsylvania	75	1	27
Indiana	84	2	25	Rhode Island	2	.....	2
Iowa	81	1	18	South Carolina	3	2	4
Kansas	67	3	19	South Dakota	19	7	9
Kentucky	67	1	14	Tennessee	39	2	17
Louisiana	3	3	5	Texas	12	7	20
Maine	25	.....	12	Utah	2	.....	3
Maryland	9	2	5	Vermont	13	.....	8
Massachusetts	22	.....	14	Virginia	7	.....	11
Mexico	.....	1	.....	Washington	14	3	7
Michigan	55	3	21	West Virginia	34	1	8
Minnesota	31	15	8	Wisconsin	47	5	13
Mississippi	7	1	5	Wyoming	2	6	1
Missouri	82	2	32				
Montana	5	3	5	Total	1,292	128	550

SUMMARY.

Boards (1,292, 3 members each)	3,876
Single surgeons	128
Expert examining surgeons	550
Total	4,554

EXHIBIT 29.—*Special examinations, number made, cost thereof, etc., during the fiscal year ended June 30, 1915.*

Amount appropriated by Congress on account of special examiners, not including salaries		$125,000.00
Expenses of special examiners:		
Per diem, in lieu of subsistence	$58,191.00	
Transportation and incidentals	30,589.89	
Miscellaneous	951.40	
Total		90,332.29
Unexpended balance		34,667.71
Average number of special examiners employed		55
Number of depositions taken		28,771
Number of reports submitted		6,523
Average cost per report		$13.85
Review:		
Number of reports reviewed and referred for further examination		3,885
Number of reports reviewed and submitted to board of review for final action		2,193
Number of reports reviewed and submitted to other divisions		772
Total number of reports reviewed in division		6,850
Cases:		
Number in division July 1, 1914	1,859	
Number received during the year	2,402	
		4,261
Number disposed of during the year		3,151
Number remaining in division July 1, 1915		1,110

EXHIBIT 30.—*Table showing the per cent of the claims of widows and dependents in proportion to the number of soldiers' deaths occurring during the year 1915.*

[The first column shows the number of deaths in each class, and the second column shows the number of applications from widows and dependents in the same class during the year.]

	Losses by death.	Widows' and dependents' claims.	Per cent.
Civil War	33,255	18,098	56
War with Spain	306	523	170
War with Mexico	205	105	51
Indian wars	133	78	51
Regular Establishment	480	681	142

REPORT OF THE COMMISSIONER OF PATENTS.

ANNUAL REPORT OF THE COMMISSIONER OF PATENTS.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
Washington, D. C., September 30, 1915.

SIR: I have the honor to submit herewith the following report of the business of the United States Patent Office for the fiscal year ended June 30, 1915:

Applications received during fiscal year ended June 30, 1915.

Applications for patents for inventions	66,497
Applications for patents for designs	2,679
Applications for reissues of patents	173
Applications for registration of trade-marks	8,376
Applications for registration of labels	947
Applications for registration of prints	444
Total applications	79,116
Disclaimers	26
Appeals on the merits	1,938
Total applications, disclaimers, and appeals	81,080

Applications for patents for inventions.

Year ended June 30—		Year ended June 30—	
1906	55,619	1911	65,365
1907	56,514	1912	69,236
1908	58,527	1913	67,986
1909	62,800	1914	69,311
1910	63,365	1915	66,497

Applications for patents, including reissues, designs, trade-marks, labels, and prints.

Year ended June 30—		Year ended June 30—	
1906	68,881	1911	74,677
1907	66,795	1912	79,747
1908	68,441	1913	78,411
1909	73,026	1914	81,539
1910	72,533	1915	79,116

Applications awaiting action.

June 30—	
1911	17,809
1912	21,059
1913	27,328
1914	22,283
1915	18,270

Patents withheld and patents expired.

	1914	1915
Letters patent withheld for nonpayment of final fees	8,010	11,882
Applications allowed awaiting payment of final fees	19,234	17,798
Patents expired	22,398	20,992

Patents granted and trade-marks, labels, and prints registered.

Class.	1911	1912	1913	1914	1915
Letters patent	33,512	34,220	35,025	36,276	42,734
Design patents	777	1,148	1,579	1,773	1,489
Reissue patents	138	171	150	176	179
Trade-marks	3,791	4,635	5,166	5,795	6,919
Labels	576	625	664	720	762
Prints	181	268	254	339	321
Total	38,976	41,967	42,838	45,080	52,404

Receipts from all sources, fiscal year ended June 30, 1915.

Applications, first fees	$995,062.00
Designs	42,978.00
Reissues	5,190.00
Trade-marks	83,217.00
Final fees	860,960.93
Appeals	22,785.00
Disclaimers	280.00
Coupons	55,238.15
Drawings	5,186.86
Recording assignments	31,638.70
Labels	5,211.00
Prints	2,579.00
Court costs	30.00
Copies of records	142,935.74
Unapplied	48.60
Official Gazette and other publications	17,596.70
Total	2,270,937.68

Expenditures, fiscal year ended June 30, 1915.

Salaries	$1,312,276.81
Scientific library	2,485.10
Law library	498.68
Postage on foreign mail	690.00
Stationery	10,710.30
Furniture and sundries	13,759.12
Ice	286.46
Washing towels	159.87
Winding clocks	187.68
Telephones	745.06
Telegraphing	45.97
Investigating public use	429.85

Photolithographing, current issue and reproductions [1]	$109,426.56
Photolithographing, foreign patents [1]	20,835.00
Photographic printing [1]	4,738.36
Photostat supplies	4,220.33
Printing and binding:	
Official Gazette and indexes	152,789.32
Specifications	412,209.75
Miscellaneous	32,176.40
International Convention for Protection of Industrial Property	665.62
Fixed charges	8,181.02
Total	2,087,581.26

Receipts and expenditures.

Receipts from all sources	$2,270,937.68
Expenditures	2,087,581.26
Net surplus	183,356.42
Total net surplus to date	7,714,316.62

Comparative statement.

June 30—	Receipts.	Expenditures.	June 30—	Receipts.	Expenditures.
1906	$1,811,297.84	$1,538,149.40	1911	$1,987,778.58	$1,957,001.85
1907	1,859,592.89	1,584,489.70	1912	2,094,059.50	2,019,236.01
1908	1,874,180.75	1,608,292.01	1913	2,082,490.23	1,924,459.42
1909	1,975,919.97	1,887,443.35	1914	2,169,988.95	1,929,132.52
1910	2,022,043.26	1,953,549.76	1915	2,270,937.68	2,087,581.26

Appellate work.

Interferences declared	1,472
Interferences disposed of before final hearing	1,341
Interferences heard	241
Interferences disposed of	212
Interferences awaiting decision	58

Oldest case awaiting action, February 2, 1915.

Appeals to examiners in chief in interference cases	147
Ex parte appeals to examiners in chief	983
Total	1,130
Appeals in interference cases disposed of	174
Ex parte appeals disposed of	957
Total	1,131
Interference cases awaiting action	48
Ex parte cases awaiting action	262
Total	310

Oldest interference case awaiting action, February 25, 1915.
Oldest ex parte case awaiting action, April 21, 1915.

[1] Paid contractor.

Appeals to commissioner in interference cases	114
Appeals to commissioner in opposition cases	32
Appeals to commissioner in cancellations	2
Ex parte appeals to commissioner	263
Interlocutory appeals to commissioner	191
Ex parte appeals in trade-mark cases	84
Total	686
Petitions to commissioner	3,607
Total	4,293
Cases disposed of by commissioner:	
Appeals in interference cases	107
Appeals in opposition cases	30
Appeals in cancellation cases	7
Ex parte appeals	254
Interlocutory appeals	211
Ex parte appeals in trade-mark cases	83
Total	692
Petitions to commissioner	3,500
Total	4,192
Appeals to Court of Appeals, District of Columbia:	
Ex parte cases	13
Interference cases	33
Opposition cases	14
Cancellation cases	4
Total	64

During the year 69,349 applications for patents, including reissues and designs, and 196,946 amendments in pending cases were filed. The number of letters constituting the miscellaneous correspondence received and indexed was 282,100.

The number of printed copies of specifications of patents sold was 2,741,621, for which a revenue of $121,559.70 was received by the office. In addition to this, 1,100,090 copies were shipped to foreign countries and 202,907 copies were furnished for governmental use.

The office received for record 31,129 deeds of assignment, an average of 456.83 words per deed.

Typewritten copies of records aggregating 27,517,400 words were furnished, at 10 cents per hundred words, and for certifying certain of these copies, $1,161.50 was received.

For 61,353 photostat copies of foreign patents, the office received $11,968.75.

Respectfully submitted.

THOMAS EWING,
Commissioner of Patents.

The SECRETARY OF THE INTERIOR.

STATEMENT OF THE COMMISSIONER OF EDUCATION.

EXHIBIT 28.—*Examining surgeons for the Bureau of Pensions, showing States in which they are located, June 30, 1915.*

States.	Boards.	Single surgeons.	Experts.	States.	Boards.	Single surgeons.	Experts.
Alabama	9	.....	7	Nebraska	46	6	7
Arizona	1	2	2	Nevada	3	.....	.....
Arkansas	19	6	8	New Hampshire	12	.....	2
California	19	4	20	New Jersey	10	.....	2
Colorado	18	6	11	New Mexico	3	7	3
Connecticut	9	1	7	New York	62	.....	31
Delaware	3	.....	.....	North Carolina	13	8	9
District of Columbia	3	.....	9	North Dakota	4	1	5
Florida	8	1	7	Ohio	90	2	37
Georgia	7	4	12	Oklahoma	35	1	13
Idaho	5	4	3	Oregon	14	4	9
Illinois	92	.....	33	Pennsylvania	75	1	27
Indiana	84	2	25	Rhode Island	2	.....	2
Iowa	81	1	18	South Carolina	3	2	4
Kansas	67	3	19	South Dakota	19	7	9
Kentucky	67	1	14	Tennessee	39	2	17
Louisiana	3	3	5	Texas	12	7	20
Maine	25	.....	12	Utah	2	.....	3
Maryland	9	2	5	Vermont	13	.....	8
Massachusetts	22	.....	14	Virginia	7	.....	11
Mexico	.....	1	.....	Washington	14	3	7
Michigan	55	3	21	West Virginia	34	1	8
Minnesota	31	15	8	Wisconsin	47	5	13
Mississippi	7	1	5	Wyoming	2	6	1
Missouri	82	2	32				
Montana	5	3	5	Total	1,292	128	550

SUMMARY.

Boards (1,292, 3 members each)	3,876
Single surgeons	128
Expert examining surgeons	550
Total	4,554

EXHIBIT 29.—*Special examinations, number made, cost thereof, etc., during the fiscal year ended June 30, 1915.*

Amount appropriated by Congress on account of special examiners, not including salaries		$125,000.00
Expenses of special examiners:		
Per diem, in lieu of subsistence	$58,191.00	
Transportation and incidentals	30,589.89	
Miscellaneous	951.40	
Total		90,332.29
Unexpended balance		34,667.71
Average number of special examiners employed		55
Number of depositions taken		28,771
Number of reports submitted		6,523
Average cost per report		$13.85
Review:		
Number of reports reviewed and referred for further examination		3,885
Number of reports reviewed and submitted to board of review for final action		2,193
Number of reports reviewed and submitted to other divisions		772
Total number of reports reviewed in division		6,850
Cases:		
Number in division July 1, 1914	1,859	
Number received during the year	2,402	
		4,261
Number disposed of during the year		3,151
Number remaining in division July 1, 1915		1,110

EXHIBIT 30.—*Table showing the per cent of the claims of widows and dependents in proportion to the number of soldiers' deaths occurring during the year 1915.*

[The first column shows the number of deaths in each class, and the second column shows the number of applications from widows and dependents in the same class during the year.]

	Losses by death.	Widows' and dependents' claims.	Per cent.
Civil War	33,255	18,098	56
War with Spain	306	523	170
War with Mexico	206	105	51
Indian wars	133	78	51
Regular Establishment	480	681	142

REPORT OF THE COMMISSIONER OF PATENTS.

ANNUAL REPORT OF THE COMMISSIONER OF PATENTS.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
Washington, D. C., September 30, 1915.

SIR: I have the honor to submit herewith the following report of the business of the United States Patent Office for the fiscal year ended June 30, 1915:

Applications received during fiscal year ended June 30, 1915.

Applications for patents for inventions	66,497
Applications for patents for designs	2,679
Applications for reissues of patents	173
Applications for registration of trade-marks	8,376
Applications for registration of labels	947
Applications for registration of prints	444
Total applications	79,116
Disclaimers	26
Appeals on the merits	1,938
Total applications, disclaimers, and appeals	81,080

Applications for patents for inventions.

Year ended June 30—		Year ended June 30—	
1906	55,619	1911	65,365
1907	56,514	1912	69,236
1908	58,527	1913	67,986
1909	62,800	1914	69,311
1910	63,365	1915	66,497

Applications for patents, including reissues, designs, trade-marks, labels, and prints.

Year ended June 30—		Year ended June 30—	
1906	68,881	1911	74,677
1907	66,795	1912	79,747
1908	68,441	1913	78,411
1909	73,026	1914	81,539
1910	72,533	1915	79,116

Applications awaiting action.

June 30—	
1911	17,809
1912	21,059
1913	27,328
1914	22,283
1915	18,270

	1914	1915
Patents published and patents expired	8,010	11,882
Patents withheld for nonpayment of final fee	19,234	17,798
Patents issued on which final fee was paid	22,398	20,992

Patents granted and trade-marks, labels, and prints registered.

Class.	1911	1912	1913	1914	1915
Letters patent	33,513	34,220	35,025	36,276	42,734
Designs	777	1,148	1,579	1,773	1,489
Reissue patents	138	171	150	176	179
Trade-marks	3,791	4,635	5,166	5,795	6,919
Labels	576	625	664	720	762
Prints	181	268	254	339	321
Total	38,976	41,967	42,838	45,080	52,404

Receipts from all sources, fiscal year ended June 30, 1915.

Applications, first fees	$995,062.00
Designs	42,978.00
Reissues	5,190.00
Trade-marks	83,217.00
Final fees	860,960.93
Appeals	22,785.00
Disclaimers	280.00
Coupons	55,238.15
Drawings	5,186.86
Recording assignments	31,638.70
Labels	5,211.00
Prints	2,579.00
Court costs	30.00
Copies of records	142,935.74
Unapplied	48.60
Official Gazette and other publications	17,596.70
Total	2,270,937.68

Expenditures, fiscal year ended June 30, 1915.

Salaries	$1,312,276.81
Scientific library	2,485.10
Law library	498.68
Postage on foreign mail	690.00
Stationery	10,710.30
Furniture and sundries	13,759.12
Ice	286.46
Washing towels	159.87
Winding clocks	187.68
Telephones	745.06
Telegraphing	45.97
Investigating public use	409.85

Photolithographing, current issue and reproductions [1]	$109,426.56
Photolithographing, foreign patents [1]	20,835.00
Photographic printing [1]	4,738.36
Photostat supplies	4,220.33
Printing and binding:	
Official Gazette and indexes	152,789.32
Specifications	412,209.75
Miscellaneous	32,176.40
International Convention for Protection of Industrial Property	665.62
Fixed charges	8,181.02
Total	2,087,581.26

Receipts and expenditures.

Receipts from all sources	$2,270,937.68
Expenditures	2,087,581.26
Net surplus	183,356.42
Total net surplus to date	7,714,316.62

Comparative statement.

June 30—	Receipts.	Expenditures.	June 30—	Receipts.	Expenditures.
1906	$1,811,297.84	$1,538,149.40	1911	$1,987,778.58	$1,957,001.85
1907	1,859,592.89	1,584,489.70	1912	2,094,059.50	2,019,236.01
1908	1,874,180.75	1,608,292.01	1913	2,082,490.23	1,924,459.42
1909	1,975,919.97	1,887,443.35	1914	2,169,988.95	1,929,132.52
1910	2,022,043.26	1,953,549.76	1915	2,270,937.68	2,087,581.26

Appellate work.

Interferences declared	1,472
Interferences disposed of before final hearing	1,341
Interferences heard	241
Interferences disposed of	212
Interferences awaiting decision	58
Oldest case awaiting action, February 2, 1915.	
Appeals to examiners in chief in interference cases	147
Ex parte appeals to examiners in chief	983
Total	1,130
Appeals in interference cases disposed of	174
Ex parte appeals disposed of	957
Total	1,131
Interference cases awaiting action	48
Ex parte cases awaiting action	262
Total	310

Oldest interference case awaiting action, February 25, 1915.
Oldest ex parte case awaiting action, April 21, 1915.

[1] Paid contractor.

Appeals to commissioner in interference cases	114
Appeals to commissioner in opposition cases	32
Appeals to commissioner in cancellations	2
Ex parte appeals to commissioner	263
Interlocutory appeals to commissioner	191
Ex parte appeals in trade-mark cases	84
Total	686
Petitions to commissioner	3,607
Total	4,293
Cases disposed of by commissioner:	
Appeals in interference cases	107
Appeals in opposition cases	30
Appeals in cancellation cases	7
Ex parte appeals	254
Interlocutory appeals	211
Ex parte appeals in trade-mark cases	83
Total	692
Petitions to commissioner	3,500
Total	4,192
Appeals to Court of Appeals, District of Columbia:	
Ex parte cases	13
Interference cases	33
Opposition cases	14
Cancellation cases	4
Total	64

During the year 69,349 applications for patents, including reissues and designs, and 196,946 amendments in pending cases were filed. The number of letters constituting the miscellaneous correspondence received and indexed was 282,100.

The number of printed copies of specifications of patents sold was 2,741,621, for which a revenue of $121,559.70 was received by the office. In addition to this, 1,100,090 copies were shipped to foreign countries and 202,907 copies were furnished for governmental use.

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STATEMENT OF THE COMMISSIONER OF EDUCATION.

STATEMENT OF THE COMMISSIONER OF EDUCATION.

DEPARTMENT OF THE INTERIOR,
BUREAU OF EDUCATION,
Washington, October 1, 1915.

SIR: I have the honor to submit the following statement of the operations of this office for the fiscal year ended June 30, 1915:

FUNCTIONS AND ORGANIZATION OF THE BUREAU.

The bureau has no administrative functions except those connected with the expenditure of the funds appropriated by the Federal Government for the maintenance of colleges of agriculture and mechanic arts in the several States and in Hawaii and Porto Rico, and those connected with the education, support, and medical relief of natives of Alaska. To the extent that funds appropriated for its use will permit, it performs higher and more important functions than could be performed by any administrative Federal education office. Definitely it attempts to do the following things:

(1) To serve as a clearing house for accurate and comprehensive information in respect to all educational agencies and all forms of education in the United States and all foreign countries, and to disseminate this information among school officers, teachers, students of education, and all others directly interested in any form of educational activity. To this end it publishes an Annual Report in two volumes, the first containing an interpretative survey of the progress of education within the year in the United States and all other countries, the second containing statistics of education in the United States; studies specific problems of education, school legislation, State and city school systems, colleges and universities, libraries, and all other agencies of education in the United States and elsewhere, and publishes the results in printed bulletins, multigraphed circulars, and letters to school journals and the public press; carries on an extensive correspondence with school officers, teachers, and others, and sends its experts to speak at meetings of National, State, and local associations.

(2) To serve as a clearing house for the best opinions on school organization and administration, courses of study, methods of teaching, and many other matters connected with popular education. For each of these subjects there are a few men and women in the

United States and elsewhere whose opinions, because of their greater knowledge of the subject, are most valuable. This bureau tries to find for each subject who these persons are and to make lists of expert advisers whom it may consult and to whom it may refer others. It also undertakes, after correspondence and personal conference with these experts, to formulate the consensus of expert opinion. In carrying on this part of its work the bureau's experts attend and participate in congresses and conferences of educators. The commissioner also calls special conferences at the office of the bureau in Washington and elsewhere. Last year he called nine of these conferences, eight national and one sectional.

(3) To advise legislatures, school officers, teachers, and others engaged in promoting and directing education. Its experts, upon request, address legislatures, meet with legislative committees and commissions, with State, county, and city school boards, with boards of trustees and faculties of normal schools, colleges, and universities, with library commissions, and with other similar bodies. It makes or directs surveys of State, county, and city school systems, and of individual schools or groups of schools, and reports its findings, together with constructive suggestions, to the proper officials. Within the year it has been engaged in nine such surveys, most of which are not yet completed, and has promised to make other similar surveys within the present fiscal year. In response to thousands of letters asking advice on specific subjects the bureau makes hundreds of studies in its library and elsewhere and gives the results of these studies in individual and circular letters.

(4) To promote on its own initiative and to assist education officers and the people of the several States and local communities in promoting what it believes to be necessary and desirable tendencies in education and in the organization of educational agencies, to the end that there may be full and equal opportunity of education for all. Within the year definite work has been done for the lengthening of school terms in rural communities; for the better preparation of teachers for rural schools; for more adequate salaries for teachers in schools of all kinds and grades; for better attendance laws in some States and for the better enforcement of attendance laws in all States; for readjusting courses of study in rural schools; for working out a better method of teaching children to read than is now in common use and in promulgating this method; in working out plans for teaching English in rural schools; in promoting education in agriculture, trades, and industries, and for home making; in the establishment of kindergartens; in the consolidation of rural schools and in making homes for teachers and school farms parts of the equipment of rural schools; in making sentiment for the promotion of teachers in graded schools from grade to grade with the children,

so as to make possible a larger degree of continuity in the school work of the children; in the promotion of school and home gardening in cities, towns, suburban communities, and manufacturing villages; toward reorganization of the 12 years of elementary and secondary schooling into 6 years of elementary and 6 years of high school—the so-called six-and-six plan—instead of the present plan of 8 years of elementary school and 4 years of high school; toward more flexible courses in the high schools and their more perfect adaptation to all classes of children; toward helping parents in the early education of their children in the home and in bringing the school and the home closer together; in encouraging boys and girls to continue their education through systematic reading after leaving school; toward the establishment of county libraries, the opening of city libraries to country people, and the establishment of school libraries; for better schoolhouses and the care of the health of school children. This work is done through printed bulletins, leaflets and circular letters, correspondence, consultation with teachers and education officers, and addresses at meetings of associations, commercial bodies, and women's clubs, and mass meetings of citizens.

(5) To determine standards of measurement in education and to conduct and direct experiments in education, to the end that we may finally have a larger body of definite scientific knowledge about education and educational processes and methods. In the first of these the bureau had the assistance during the year of a group of 15 special collaborators working under the direction of Dr. George D. Strayer, of Teachers College, Columbia University. In the second it has been able to do very little, and it can not do much until there are special appropriations for experiments in education under scientific control.

The bureau is now organized under the following divisions: Office of the chief clerk, the Alaska division, mails and files, library, statistical, editorial, higher education, school administration, industrial education and education for home making, agricultural education, rural schools, civic education, education of immigrants, education of negroes, school and home gardening, kindergarten, school sanitation and hygiene, and home education. The division of industrial education and education for home making, with three specialists, the division of school and home gardening, with two specialists and one assistant specialist, and the division of agricultural education, with one specialist, have been created within the year. The division of rural schools has lost one specialist and has gained two assistant specialists. The division of school administration has increased by the addition of one specialist. These additions and some others were made possible by an additional appropriation amounting to $30,600, which became available at the beginning of the fiscal year.

The Alaska division has offices in Washington, Seattle, and Nome. The kindergarten division has offices in Washington and New York. The home education division has offices in Washington and Philadelphia. The division of school sanitation and hygiene has offices in Washington and Nashville, Tenn. All other divisions have offices only in Washington. There are substations under designated directors at Columbia University, University of Chicago, George Peabody College for Teachers, and Leland Stanford Junior University.

Brief statements of the work of the several divisions follow:

HIGHER EDUCATION.

The specialist in higher education has within the year visited 64 colleges and universities, 37 of which have been carefully inspected and reported upon. One was inspected at the request of the President of the United States, August 17 and 18, and a report was rendered to the Secretary of the Interior for transmission to him. Twenty-eight were North Carolina institutions. These were visited at the request of the State superintendent of public instruction, who desired a careful inspection and report upon the colleges of the State. The report was not finished before the end of the fiscal year, but was completed and submitted July 17, 1915. Seven of the institutions visited were Oregon institutions. In accordance with an act of the Oregon Legislature of 1911, authorizing the State superintendent of public instruction to exempt from examination for the State high-school teacher's certificate graduates of those collegiate institutions of the State which the United States Bureau of Education might certify as being of standard college grade, the bureau made an inspection of these institutions in the latter part of that year. The present inspection was undertaken at the request of the State superintendent of public instruction in the belief that the standards of certain colleges of the State had changed since the first inspection was made. The report on the inspection was rendered to the State superintendent in March.

The specialist in higher education cooperated with the commissioner in making a preliminary survey of higher institutions in the State of Washington. He assisted legislative committees of the State in drawing up certain bills embodying recommendations made in the commissioner's report of the survey. One of these bills was enacted into law. The other was not reported from committee.

The specialist in higher education has represented the bureau at the inaugurations of the presidents of the University of South Carolina, Johns Hopkins University, and Tufts College, at the twenty-fifth anniversary of the founding of the Catholic University of America, and at 15 conventions and association meetings. He

has made 28 addresses before associations, faculties, and students of colleges, boards of trustees, and other audiences. He has acted as vice chairman of the section on education of the Pan-American Scientific Congress, representing the commissioner on the executive committee of the congress.

Two bulletins have been prepared by the division under the direction of the specialist in higher education, one of them on "Accredited Secondary Schools in the United States," 1915, No. 7; the other on "Opportunities for Foreign Students at Colleges and Universities in the United States" (in press at the close of the fiscal year, but issued in August as Bulletin, 1915, No. 27). In addition he has prepared five higher education letters and a chapter on higher education in 1914 for the commissioner's annual report.

At the request of the Adjutant General of the War Department, this division has rendered decisions as to the eligibility of 402 universities, colleges, and schools for inclusion in the list of institutions to be accredited by the United States Military Academy.

The organization of a committee on higher educational statistics, composed of members of the large national associations directly interested in higher education, mentioned in my statement of last year, has been completed and has begun its work. The division of higher education is also cooperating with seven other committees of national associations in the investigation of problems relating to higher education.

The specialist in land-grant college statistics examined and certified the reports of the expenditures of the Federal appropriations made to the land-grant colleges, collected and tabulated the reports of presidents and treasurers, and prepared this material for publication as a chapter of the commissioner's report. He collected the statistical information and designed a series of charts to illustrate the land-grant colleges, the State-aided colleges, and other universities, colleges, and technological schools for the bureau's exhibit at the Panama-Pacific Exposition; also charts to illustrate the changes in administrative organization and academic development of certain classes of universities during 30 years. He has begun a study of the present condition of the principal and income derived from the land grants of the Morrill Act of 1862. Definite information on this subject is difficult to obtain, many of the colleges benefited by the act not having kept records which show the exact status of the fund derived from it. This study will carry with it a brief history of the organization of each of the land-grant colleges. He has visited six land-grant colleges for Negroes and five land-grant colleges for whites in the States of West Virginia, Kentucky, Arkansas, Mississippi, Alabama, and Tennessee, and has examined their business organiza-

tion and methods. He has also made a study of the methods of registration in 100 colleges and assisted in an inquiry into the teaching of Portuguese and Spanish in the secondary schools of the United States.

The division has conducted a large correspondence, preparing replies to from six to a dozen letters of inquiry daily. While most of this work is of a routine nature, many of the replies can only be made after somewhat prolonged investigation.

SCHOOL ADMINISTRATION.

The division of school administration has completed a bulletin on the administration of schools in cities having a population not less than 2,500 nor more than 30,000. This bulletin was prepared in response to a demand from school officers for a publication setting forth the duties generally required of administrative officers in cities of this size, and the way in which these duties are generally performed.

The division prepared for the commissioner's report a chapter on current progress in education in cities of less than 25,000 population, and began an annotated bibliography of the more important topics in the reports of city schools, which will be helpful to all students of education. It is also preparing a card catalogue of the more important of these reports.

The division issued 15 city school circulars on various phases of city school work. In response to special requests it has criticised and offered suggestions for improvement in many courses of study in the public schools of small cities, and has compiled memoranda on religious instruction and Bible reading in the public schools; school bonds; absence of teachers on pay; high-school fraternities; length of time served by superintendents in the smaller cities; length of daily school sessions in a number of cities; and many other subjects.

It has received, entered, and filed approximately 2,000 reports, courses of study, rules and regulations, and directories of city schools, and miscellaneous publications relating to city school work.

The chief of the division delivered many addresses at college and university summer schools, teachers' institutes, school rallies, high-school commencements, and State educational meetings. These included "Teaching observed in city schools," "Economizing the pupil's time," "A wider use of the school plant," "Interesting a community in its schools," "Educating for new conditions," "The six-year high school," "How a superintendent may survey his own schools." He attended the meetings of four national education associations, and assisted a committee of the National League of Compulsory Attendance Officials in making a study of school attendance in cities.

The division completed the compilation of a digest of the general school laws of all the States, which is now being published as a bulletin of the bureau. Appended sections to the digest treat of "State constitutional provisions relating to public education" and "Public school systems in American territories, districts, and insular possessions." The preparation of the digest has involved the examination and summarizing of approximately 15,000 pages of school law and State constitutions. The subjects treated are arranged according to a logical scheme of classification in use in the bureau for several years, and about 8,000 cross-references are inserted.

The division has also completed an historical study of the development of public education in the State of Alabama, the results of which have been published as a bulletin of the bureau, and has begun a similar study of education in Tennessee. The main purpose of these studies is to give to the people of the States of whose school systems the studies are made information that will be helpful to them in their efforts toward the further development of their school systems.

A specialist in educational systems was added to the division in November, 1914, to investigate current methods of teaching reading in the primary grades and to formulate such methods as will improve the teaching of reading in the elementary schools. She has begun an inquiry into the methods of teaching reading in schools in the United States and abroad; she has studied standard tests in reading ability, has investigated the subject of school hygiene in connection with the teaching of reading, and has tabulated the contents and vocabularies of 150 primary reading books. She has conducted an experiment in teaching reading by a "Phonic method" in the primary schools of Washington, D. C., has demonstrated this method in the summer school of the University of Virginia, and has corresponded with many hundreds of primary teachers on this subject.

SCHOOL BUILDINGS AND SCHOOL SANITATION.

The Bureau of Education has no funds wherewith to employ full-time specialists in the interest of the improvement of school buildings and the health of school children, but during the past year two special agents on part-time appointment have responded to as many as they could of the demands for help on these important subjects.

One of these special agents, located at Nashville, Tenn., has on request given specific advice to school authorities in regard to the architecture of school buildings and the hygiene and sanitation of schoolhouses and grounds, particularly in rural communities. He has had charge of the models of rural schoolhouses which the bureau has been lending to communities about to erect new buildings, and

has distributed them among school and school officers where they could be utilized to the greatest advantage in guiding and developing a taste for a better type of rural school architecture. It has been the practice to give preference in lending these models to those who would agree to duplicate them and undertake to adapt the plans suggested to local needs and local climatic conditions. Counties in several States have taken these models as standards and are working out better school buildings for their rural districts. This special agent has spent some time helping with rural school surveys in several counties in Tennessee and has attended meetings of associations interested in public health in Cincinnati, Chicago, and Houston, Tex. He has held conferences in Nashville with school officers from all parts of the country, especially from Tennessee and the adjoining Southern States. In cooperation with Mr. Sherman C. Kingsley, of the Elizabeth McCormick memorial fund of Chicago, he has prepared a bulletin on open-air schools, and in cooperation with Miss Helen Le Garde, of Providence, R. I., he is preparing a bulletin on school baths. He has also completed a bulletin on schoolhouse architecture, which is supplementary to a comprehensive bulletin which he prepared for this bureau in 1910, and which has been of very definite value to school boards and school architects in this and other countries. This special agent has also been made director of the recently established substation of the Bureau of Education at Nashville, reference to which is made elsewhere in this statement.

The second special agent in this division was appointed in January, 1915, and has given to the bureau 18½ days of service in the office at Washington. In this time he has conducted correspondence relative to the health of school children, has studied and summarized the work of the bureau on this subject in the past three years, and has helped make plans for the continuation and improvement of this work. He is cooperating with Dr. J. H. McCurdy, of the International Y. M. C. A. Training School, Springfield, Mass., in preparing for this bureau a comprehensive study of the status of physical education, athletic training, health supervision, and instruction in hygiene. He is cooperating with the members of the Board of Health of the Territory of Hawaii in making a comprehensive study of health conditions of school children in one or more of the Hawaiian islands.

Requests which come to this bureau emphasize particularly the need for more assistance in planning school buildings; in the care of the health of school children; in the improvement of janitor service in schools; in methods of lighting, heating, and ventilating; in school furniture; in the hygiene of school instruction; in more intelligent adaptation of school work to defective children; in school lunches; and in the organization of special schools.

INDUSTRIAL EDUCATION AND EDUCATION FOR HOME MAKING.

During the year there has been formed a division of industrial education and education for home making. A specialist in industrial education was appointed in August, 1914, and two specialists in home economics in March, 1915.

The specialist in industrial education has spent almost two-thirds of his time in the field and away from Washington. Immediately after his appointment he spent 40 days in an industrial survey of the city of Richmond, Va., and in helping the school officers of that city to inaugurate a system of vocational extension education. He then gave four days to the superintendent and board of education of Schenectady, N. Y., in conferences concerning an industrial survey of that city. In the winter he gave 16 days to the commission on vocational education for the State of Washington and made 29 addresses in eight cities of that State. In the winter and spring he spent more than three months in visiting schools in 53 cities, in 16 States, including all of the Pacific coast States. He visited and participated in 23 National, State, and local conferences on industrial education, 3 of which were called by the Commissioner of Education. From the time of his appointment to the end of the fiscal year he made 81 addresses on various problems connected with vocational education to audiences of teachers, members of boards of education, labor unions, commercial organizations, school patrons, and others.

While in the office he prepared for the Report of the Commissioner of Education a chapter on vocational education. He also prepared for publication a report of the Chicago conference on the training of teachers for vocational education, a summary and abstract of the bulletin on selection and training of teachers for State-aided industrial schools for boys and men, a report of the Richmond conference on the training of teachers for vocational education, a report of the Cincinnati conference on vocational education in small cities, portions of the report of the Richmond industrial education survey, and seven letters in the "vocational education letters" series. He has also prepared a course of study in the manual arts. He has begun the preparation of mailing lists of special teachers and directors of manual arts and vocational education, the revision of statistical schedules relating to this subject, and the preparation of a set of model forms of records and reports for vocational schools.

Of the two specialists in home economics, one has been assigned to the task of cooperating with the departments of home economics in colleges of agriculture and mechanic arts, and the other specialist will cooperate in a similar way with normal schools for training teachers. Both will do what they can for the improvement and extension of

education for home making in elementary and secondary schools, one in the schools of the Northern and Western States and the other in the schools of the Southern States. The first of these specialists was at the time of her appointment on the Pacific coast, and before coming to Washington she visited forty or fifty schools, including universities, colleges of agriculture and mechanic arts, normal schools, and city high schools in California, Oregon, Washington, Idaho, Montana, North Dakota, Minnesota, Wisconsin, Illinois, and Indiana; attended the meetings of the Central California Teachers' Association, meetings of the Inland Empire Teachers' Association and of the Washington State Congress of Mothers at Spokane, and the meeting of the Wisconsin Congress of Mothers and Parent-Teacher Associations. Later she visited schools in New York and Delaware, participated in a rural education conference at Purdue University, Indiana, and prepared plans and a program for a conference of heads of departments of home economics in land-grant colleges which was called by the Commissioner of Education to meet at the University of California the second week in August.

The second specialist in home economics prepared a six weeks course of study in home economics for women of rural communities, studied conditions in rural communities in the State of Delaware, and planned and directed four schools of home making in that State. These schools, each of which was in session three days in the week for five weeks, were attended by the married women and older girls of the communities in which they were held. They were planned and directed in cooperation with the department of home economics in Delaware College as an experiment and in the hope of finding some practical means by which instruction in regard to the all-important work of home making in rural communities may be brought to the millions of countrywomen who can never be helped much by any plan yet worked out. The experiment seems to be a success, and it is expected that the plan will be tried in a much larger number of communities within the present fiscal year. This specialist also visited rural schools in Baltimore County, Md., and made an extended trip through the States of New Jersey and New York and all the New England States studying the work which the normal schools of these States are doing in preparing teachers to give instruction in elementary and secondary schools in regard to home making. She has prepared a mailing list of public schools, colleges, and normal schools in which instruction in home making is given.

RURAL EDUCATION.

At the beginning of the year the appropriation for the division of rural education became available for services in Washington, and four specialists who had previously had headquarters in different

sections of the country were transferred to the District of Columbia. The work of the four specialists was differentiated, one receiving the title of rural school extension agent, the others of specialist in rural education, rural school practice, and rural school administration, respectively. In January two women were appointed as assistants in rural education, both of whom had had wide experience in rural school affairs, one having been a State superintendent of public instruction, the other a rural school supervisor and an instructor in the department of education of a State university.

The work of the division includes:

I. Investigation of rural and agricultural education.
II. Distribution of information in regard to rural and agricultural education.
III. Propaganda through general and special educational meetings and through meetings of rural-life organizations, such as farmers' clubs, women's clubs, school improvement associations, etc.
IV. Personal advice, given upon request, to State legislatures, State and local school officers, school superintendents, supervisors and teachers, and school cooperating organizations, such as parent-teacher associations and civic clubs.

Members of the division have spent from one-fourth to one-half of the time in the field visiting rural schools, advising rural school officers, State education officers, and State legislatures, and attending educational meetings. While in the field they have lectured before State legislatures, commercial clubs, farmers' organizations, women's organizations, parent-teacher associations, education meetings, teachers' institutes, summer schools, colleges, normal schools, high schools, county school rallies, fairs, etc. In this work they have visited nearly all the States of the Union and have participated in more than 100 important conferences.

The division has prepared 10 "rural letters" to be multigraphed and sent to all rural school superintendents and to others interested in rural schools, and has also assisted in the preparation of the bureau's exhibit at the Panama-Pacific Exposition.

The division has now 15 sets of lantern slides on five different phases of rural education, which are loaned to rural school officers for short periods. They are sent by express at the expense of the borrower. An outline lecture accompanies each set.

The specialist in rural school administration, in addition to his share in the activities mentioned above, has prepared for publication during the year the chapter on progress in agricultural education for the annual report of the commissioner for 1914 and four bulletins on Consolidation of rural schools and transportation of pupils at public expense, County-unit organization for the administration of rural schools, Organization of State departments of education, and Free textbooks and State uniformity. He has also assisted in the preparation of bulletins on Important features in rural-school im-

provement, Agricultural teaching, A statistical study of the public school system in the southern Appalachian Mountains, Agricultural schools in Minnesota, and Agricultural schools in Georgia.

With the assistance of the specialist in rural education, he has made an extensive study of the size of rural school districts in about one-half of the counties in the United States, the attendance in each district, the number of teachers, etc., and, for comparison with these figures, others showing for each county the number of school districts needed if they averaged 12 square miles in extent, the number of children that would then be available for each school, and the saving in buildings and in the number of teachers that would result from such an arrangement. The result of this study will be published as a bulletin of the bureau, to assist in a campaign for enlarged rural school districts. He has examined the education bills before the 43 legislatures in session during the year and prepared digests of them. These digests were issued as "legislative circulars" and sent to persons interested especially in school legislation, including all members of committees on education in all State legislatures in session during the year. He has met with State committees, State school code commissions and similar bodies preparing educational legislation in several States and has assisted in the preparation of proposed legislation in others. He appeared personally before the education committees of the State legislature or before the full legislature in six States. He has served as secretary of the committee on college organization and policy of the association of American agricultural colleges and experiment stations, and as such is directing investigations and studies being made under the general direction of this committee, and has assisted the standing committee on instruction in agriculture of this association in the studies it is making.

The specialist in rural education, in addition to the general work and the work with the specialist in rural school administration mentioned above, made investigations and prepared reports on the extent of the movement for furnishing homes for rural teachers, on schools for the education of adults and the eradication of illiteracy in rural communities, and on the movement for establishing teachers' employment agencies in connection with State departments of education. The last two months of the year he spent in Porto Rico, studying the rural schools in that island in comparison with the schools of the Philippine Islands. Special attention was given to the means adopted in these schools to make the education given in them meet the needs of the rural and village life of the island.

The specialist in rural school practice spent much of the time in the field, visiting 24 States and the Province of Ontario, studying the rural schools, participating in conferences on rural education, and making approximately 154 formal addresses. He directed the special

work in rural education in three summer schools and had charge of the programs on rural education in more than half a dozen general conferences. He is chairman of the educational committee of the National Survey Association organized at the Chattanooga meeting of the Southern Conference for Education and Industry. The rural schools studied were in Ontario, Nebraska, Kansas, Texas, New Mexico, and Iowa. He has prepared the following bulletins: "Efficiency and preparation of rural school teachers;" "The rural school system of Minnesota;" "The school system of Ontario, with special reference to the rural schools;" "The status of rural teacher preparation in county training and high schools." The most important work of the specialist in rural school practice and the assistants in rural education has been a study of the rural school curriculum for the purpose of reorganizing it on the basis of what farmers and farmers' wives, men and women who live in the country, make the country homes, and cultivate the soil, need to know. This I regard as the most important piece of work ever undertaken for the improvement of rural schools in this country. If well done, its effects will be far-reaching. Plans for the National Rural Teachers' Reading Circle have been completed and the books selected. The purpose of this is to encourage the ablest and most progressive rural teachers to systematize their professional study and to extend it far beyond that which is usually done in State and county reading circles for teachers. The result should be the development of more intelligent leadership. In cooperation with the specialist in rural school practice, the assistant specialists in rural education have prepared a bulletin on "Teaching English in rural schools." One of them conducted through a period of two months an experiment in teaching English in one of the rural schools of Clarendon, Va.

The rural school extension agent attended 48 national, sectional, State, county, and local conferences on rural schools and rural school extension in 19 States and made from one to five addresses at each of these. He prepared the program for and conducted the first national conference on teacher training for rural schools, which upon the call of the Commissioner of Education met at Chicago September 26–28, 1914. In October he assisted the State superintendent of Vermont in a campaign for the improvement of the rural schools of that State. In November, at the request of the Board of Education of Alabama, he assisted in a survey of the normal schools of that State. He prepared the program for the meeting of the national association of inspectors and supervisors of rural schools, held on the call of the Commissioner of Education in connection with the meeting of the Department of Superintendence of the National Education Association at Cincinnati in February, and participated in the discussions of this meeting. In April and May he assisted the State

school officers of Maryland in a State-wide campaign for the improvement of the rural schools of that State, making addresses at large meetings of citizens in nine counties. He prepared the program of the conference on rural libraries held in connection with the Southern Conference for Education and Industry at Chattanooga, in April and May, and acted as secretary of this library conference. In May and June he assisted the school officers of Dade County, Fla., in a very successful campaign for school consolidation in that county. He prepared for the commissioner's report the chapter on progress in rural education. He has prepared a list of books for rural school libraries, and has carried on an extensive correspondence on the preparation of teachers in rural high schools, on rural school extension and rural life betterment. For publication in educational journals and the general press he has prepared the proceedings of the First National Conference for Teacher Training for Rural Schools, and articles on teacher training in high schools, women's clubs in rural communities, and the needs of farm women. He has also conferred with school officers on plans for a cooperative nation-wide campaign for lengthening the terms of rural schools and for their better equipment and general improvement.

SCHOOL AND HOME GARDENING.

Within the year the division of school and home gardening was established, with two specialists and an assistant specialist. The assistant was appointed in September and the two specialists in January. In the establishment and maintenance of this division the bureau has had the valuable cooperation of the International Child Welfare League.

The purpose of this division is to promote home gardening by children of school age in cities, towns, suburban communities, and mill villages, both for its educational value and for the contribution which may thus be made to the support of the families of which the children are a part. This purpose is set forth in more detail in section 6 of the introduction to the Report of the Commissioner of Education for 1913. The plan as worked out by the specialists in the division involves: (1) The utilization of home back yards, vacant lots, and other available plats of land for children's gardens, to be cultivated under school supervision. (2) The employment of a teacher trained and skilled in gardening for each elementary city school; two or more for each large school. These teachers should be employed for the entire year, with a brief vacation in the winter if desired. (3) During school hours garden teachers should give classroom instruction in elementary science, nature study, and if required, other regular school subjects. Actual work in the garden should not be attempted during regular school hours. After school hours, on

Saturdays, and during vacation the garden teachers should spend their time in assisting the children in finding suitable places for gardens, showing them how to prepare the soil for planting, helping to select sites, directing the planting, cultivation, and harvesting, and assisting in marketing and preserving the vegetables and fruits produced. The garden work should continue as nearly all the year as the climate of the place will permit, and every plat of land should be made to produce as large a quantity as possible of vegetables, fruits, and flowers. (4) Children should be urged to make their gardens as large as they can cultivate thoroughly, if so much land can be had, but the garden should never be larger than can be cultivated properly. (5) The products of the garden should be used, first, to supply the homes of the children, and only the surplus should be sold or canned. Concisely, the plan calls for an intensive system of gardening done by children under the direction of the school, the application of business methods and intelligent direction and close supervision.

In addition to planning the work, preparing and distributing a series of circular letters, outlining the plan and giving instruction for putting it into operation, making suggestions as to the care of gardens, and giving information about progress of the work, the specialists and the assistant specialist visited many cities, towns, and mill villages in Arkansas, Missouri, and most of the States east of the Mississippi River, talked with school boards, superintendents, principals, and teachers, and with members of women's clubs and civic associations interested in this subject, assisted in making garden surveys of available vacant lots in several cities, held meetings of teachers employed in garden work, attended meetings of education associations, and in many other ways disseminated information about this work and made sentiment for it. Response to their efforts has been very generous. Of 820 city superintendents replying to a letter on the subject sent out by the bureau, 647 expressed interest in it. Reports received show that more than 100 superintendents have adopted the plan and that 35 have already put it into operation in one or more schools. In several other cities the older plans of school gardens have been modified by the adoption of the main features of this plan. No attempt has yet been made to do systematic work in the States west of the Mississippi River, and for greater effectiveness each member of the division has attempted to cover only a limited field. The chief of the division has spent much of his time in Westchester County, N. Y., where, through local assistance, an attempt is being made to put garden work into all the schools of the county. The other specialist has given much time to the State of Delaware, where plans have been formulated to put school gardening into all the city and town schools of the State, and has made a careful study of several

cotton mill towns in Georgia and the Carolinas. The assistant specialist has spent most of her time in Virginia, the Carolinas, east Tennessee, and Alabama.

The principal difficulty in having this plan put into operation comes from the lack of teachers prepared to do the work. For this reason arrangements were made with Cornell University, Teachers College of Columbia University, and George Peabody College for Teachers, Nashville, Tenn., for courses in gardening in their summer sessions, and the three members of this division were detailed to teach in these schools, one at each place, the schools paying their traveling and local expenses. Attendance on the classes was encouraging. Several cities sent teachers to each of these schools that they might be prepared to undertake this work next school year. Similar courses were conducted at some other schools at our suggestion.

Although the attention of this division has been confined to sections of States east of the Mississippi River, interest in the plan has extended to all parts of the country. There is great need of more help in the division, so that the systematic work of promoting the plan may be extended to other parts of the country. The correspondence of the division has grown to such an extent that it requires all the time of one person.

NEGRO EDUCATION.

The work of the division of Negro education, which has been continued through the year with the cooperation of the Phelps-Stokes fund, has included two distinct lines of activity: First, a comprehensive survey of all private and higher schools for Negroes; second, constructive efforts to improve the work of these schools.

The fieldwork of investigation completed in June, 1915, entailed from one to four visits to each of 575 private, secondary, and higher schools, as follows:

Alabama	68	Missouri	4
Arkansas	22	North Carolina	73
Florida	26	Ohio	5
Delaware	7	Oklahoma	7
District of Columbia	4	Pennsylvania	6
Georgia	75	Rhode Island	1
Illinois	3	South Carolina	56
Indiana	2	Tennessee	30
Kansas	2	Texas	23
Kentucky	14	Virginia	55
Louisiana	32	West Virginia	3
Maryland	14	New Jersey	4
Mississippi	39		

Inquiry was made in regard to 50 or more schools generally included in lists of schools for Negroes, but which were found not to

be in existence. In cities where private schools for Negroes were visited, the public schools for Negroes were also studied and special reports were made on the public high schools for Negroes.

Three agents, special collaborators of the Bureau of Education, have given their time to this study from its inception in 1913, and a fourth was added in August, 1914. In addition to the work of these regular agents, experts in accounting, in architecture, and in industrial education have visited and inspected schools of strategic importance.

The questionnaire used in making the study of the Negro schools covered ownership, management, attendance, teachers, organization and curriculum, finances and plant. A full report on each of these features was obtained by conversation with school officers and examination of the records at each institution.

In addition to the questionnaire, a card showing age, grade, home address, and course of study was filled by pupils above the eighth grade and in some schools by pupils below the eighth grade. In many schools teachers were also requested to fill special cards.

The summer months have been spent in tabulating the statistics and preparing reports on individual schools. In so far as possible, particular care is taken to work out constructive recommendations in each report.

An analysis of the facts assembled shows that the great needs of the worthy schools are a better system of records and accounting, simplicity in the arrangement of their courses of study, and adaptation of their teaching to the needs and condition of their pupils.

The need of such a report on schools for Negroes as is made possible by this study is shown by the number of applications for confidential information on the schools studied. In the past many donations have been made to unworthy schools. Donors are realizing this fact and are asking more and more for the information gathered by this division to enable them to decide wisely whether or not to continue their donations.

In order to correct some of the conditions found in the Negro schools, the most obvious faults have been selected. On the basis of some of the audits made, systems of accounting have been proposed for several schools and small financial assistance secured to aid them in installing the systems. To create an interest in home training and to make the domestic-science courses more effective, schools have been urged to inaugurate regular dormitory inspection. As dormitories for boys were found uniformly in worse condition than those for girls, a fund of $100 was secured from the Phelps-Stokes fund to be offered as prizes in four schools for the boys who kept their rooms in the best condition for a year. The rules for this contest were carefully worked out, after studying the regulations governing

the dormitories of the naval and military academies at Annapolis and West Point. These rules were transmitted to the school officers for their guidance in their daily inspection and grading of rooms. In each instance a prominent person has been secured to deliver the prize at the commencement exercises. These prizes aided the schools in which they were offered, and the publicity given to the contests has caused other schools to increase their attention to the care of dormitories. In order to relate the work of these schools to the rural life of their pupils, courses in gardening and simple industrial work have been encouraged. In some cases the salary of instructors in these courses was supplemented by small appropriations from the Phelps-Stokes fund.

An effort has been made to improve groups of schools by assembling the representatives of denominational and private boards controlling schools for Negroes in the South. The representatives of these boards meet and discuss cases in which schools are duplicating one another, and determine ways and means of inaugurating necessary changes in their organization and management. One of these meetings was held in the office of the Commissioner of Education upon his invitation.

The success of these experiments has led the Phelps-Stokes trustees to decide to continue and enlarge the constructive side of work with Negro schools. When the report on schools is compiled, the time of three agents will be devoted to constructive work.

CIVIC EDUCATION.

The division of civic education, established two years ago with the cooperation of the National Municipal League, to ascertain what constitutes effective civic education, what methods have been proposed or are in use to accomplish it, and to disseminate this information as widely as possible, has continued the publication of its series of multigraphed letters on civic education. These publications contain accounts of the best thought and methods in this field, and the response to them in the form of some 250 requests for information and assistance has demonstrated their value. The division has met these requests as fully as possible through correspondence and conferences. The special agent in civic education visited Columbus, Ohio, for a series of conferences with school authorities relative to provision for civic education in a reorganized course of study. He has cooperated with representatives of civic organizations and school and health authorities of Montgomery County, Md., in outlining a program of civic education for that county, and has presented the program at three conferences. He has cooperated with various civic educational agencies of North Carolina which are working on this problem, and has suggested plans for organizing systematic civic education in the schools of the State. The superintendent of schools

of Wilmington, Del., has arranged for the special agent in civic education to assist in organizing a course of civic education for the elementary schools of that city and in reorganizing the high-school course in the same subject and to conduct conferences with the city teachers and normal-school students.

The special agent in civic education during the year made special investigations as to the kind of teaching and training for efficient citizenship that can best be given in elementary schools. In the course of this investigation he prepared a bulletin on civic education in elementary schools as illustrated in the schools of Indianapolis, which has been published as a bulletin of the bureau. He has cooperated with the National Education Association's commission on reorganization of secondary education and with the American Political Science Association committee on instruction in government in studying problems of civic education in the secondary schools. He has prepared for publication an abstract of the report of the committee on social studies of the National Education Association's commission on reorganization of secondary education as Nos. 4–8 of the civic education series, and has cooperated with this committee in preparing a manual on the "Teaching of Community Civics," which has appeared as a bulletin of the bureau.

EDUCATION OF IMMIGRANTS.

In April, 1914, in cooperation with the North American Civic League, there was established in the bureau a division of education of immigrants for the purpose of studying the problems connected with the education of immigrants and their preparation for American life and citizenship, and to assist in making more adequate provisions for giving to immigrants such instruction and help as will enable them to appreciate American ideals, adjust themselves to American industrial conditions, understand American social and governmental institutions, assume the responsibilities and perform the duties of American citizenship, and participate intelligently and with good will in the democratic life of the country.

To obtain material for the formulation of a general policy of National, State, and local action an investigation of the provisions already made in different parts of the country for the instruction of immigrants was begun. The scope of this investigation includes (1) legislation in regard to public schools, public-school administration, content and methods of instruction, and public-school extension; and (2) purpose, organization, administration, and maintenance of private agencies and their methods of work.

The work of public evening schools was studied first; then a collection was made of reports from private organizations and societies dealing with immigrants in an educational or semieducational way,

and an inquiry was made into the nature of educational activities carried on by industrial establishments, such as safety instruction, first-aid training, workers' classes, and general welfare work. Statistics of the Federal census of 1910 were carefully tabulated and prepared for each State, for the whole country, and for the principal cities, to determine the number of foreign-born whites of stated ages unable to speak English, and of those unable to read or write in any language; also, the number attending school and the number naturalized. The States and cities having large numbers of immigrants were compared for the purpose of finding where most help is needed. A comparison was made of the inability to speak English and of total illiteracy on the one hand with school attendance on the other. A comprehensive study was made of laws relating to the establishment and maintenance of night schools, of compulsory-attendance laws with special reference to alien children and adult illiterates, of part-time continuation classes, and of provision for industrial training.

Early in the year the specialist in the education of immigrants visited the States of the Pacific coast for the purpose of interviewing State education officers, superintendents of schools, and others interested in the education of immigrants. He has cooperated with the department of labor of the State of Pennsylvania in an investigation of school facilities provided for aliens in that State. Seventy cities and towns were included in the investigation. In December a special report showing the results of the investigation was rendered to the commissioner of labor and industry. During this month he also assisted in a special investigation in the State of Rhode Island, with special reference to the city of Providence, and made a report showing the facilities already provided for the education of immigrants and containing recommendations for the improvement of these facilities. Later he made to the State commissioner of education of the State of New York a report containing a review of the situation in that State and specific recommendations for improvement. Two bills were drafted covering these recommendations. One bill provided that evening schools must be maintained in all cities of the first, second, and third class, and in all other towns or cities where more than 20 persons apply for instruction. The other bill provided that all persons between the ages of 16 and 21 years unable to read, write, or speak the English language intelligently shall attend some public day or night school until such time as they have gained such skill in the use of English as would be obtained by a child in the first five grades of the school. He suggested to the School of Social Economy in St. Louis, Mo., plans and methods for an investigation of facilities for the education of immigrants provided in St. Louis and Kansas City, the inquiry to be conducted under the joint auspices of the Bureau of Education and the School of Social Economy. He also

made similar suggestions to the Chicago School of Civics and Philanthropy and the Immigrant Protective League of Chicago for a joint inquiry into schools provided for immigrants in the State of Illinois. These investigations are now under way.

This division has cooperated with local school officials. At the request of the superintendent of schools in Bayonne, N. J., a special investigation was made into the needs of the evening schools of that city. Recommendations supported by the results of the investigation were submitted to the superintendent and are now being put into effect. The most important of these recommendations was that the superintendent should appoint a director of evening schools or a supervisor of immigrant education and should adopt methods more suitable to the needs of adult immigrants. At the request of the superintendent of schools of Wilmington, Del., a survey was made of facilities for the education of immigrants in that State. This was done as a part of the general survey of the State of Delaware, which has been undertaken by the Bureau of Education. The specialist in immigrant education assisted in a conference of naturalization officials, judges, and school officials held in Philadelphia to discuss plans of cooperation between the school officials and the naturalization officials for the improvement of opportunities for education of aliens in that city. Many other school officials and teachers have been assisted through correspondence and circular letters.

This division has entered into correspondence with the officials of all the more important education and civic associations interested in the subject of the education of immigrants, and several of these associations have already begun to work out programs in accordance with the suggestions of the specialist in education of immigrants. At the request of the New York State Teachers' Association this division is arranging for a two days' session on immigrant education in connection with the meeting of that association. Similar help is being given to State teachers' associations of Missouri and Washington. Help was given to the National Association of Corporation Schools in planning for the annual meeting of this association a program on the industrial aspects of education. The specialist in the education of immigrants assisted in planning for the meeting of superintendents of cities of 250,000 population or more, held in connection with the Department of Superintendence of the National Education Association at Cincinnati, a program for the consideration of problems presented by adult immigrants and illiterates. He has also cooperated with the League of Library Commissions in the selection of foreign-language books. At the request of the commissioner of labor and industry of the State of Pennsylvania, he drafted a bill creating a State bureau of employment in the department of labor and industry. At the request of the California Commission on

Immigration and Housing he has begun cooperation with that commission in its efforts to make California an experimental station in working out problems of immigrant education. In consultation with the United States Commissioner General of Immigration he has devised a plan whereby the names, prospective addresses, and nationalities of immigrant children and the relationship of the persons to whom they are sent shall be collected upon blanks specially drafted by this division for this purpose and sent regularly to the superintendents of schools in the cities to which the children are destined. Superintendents of city schools have been notified of this plan, and many of them have expressed their hearty appreciation and desire to cooperate. The specialist in this division has assisted in calling attention to the importance of better opportunities for the education of immigrants through addresses before important organizations interested in the subject in different parts of the country. Two circulars on civic education of immigrants have been issued by the division, which also prepared for the report of the Commissioner of Education a chapter on recent progress in education of immigrants.

KINDERGARTEN EDUCATION.

Through continued cooperation of the National Kindergarten Association the kindergarten division of the bureau has continued and extended the services which it renders to those who are especially concerned in the education of young children. The work of the division has improved in quality and increased in volume.

A statistical survey has been made of all kindergartens in the United States, and the results have been published in volume 2 of the Report of the Commissioner for 1914. The figures show a substantial gain in kindergartens within the past two years. The division prepared for volume 1 of the Report of the Commissioner a chapter reviewing the progress of kindergarten education within the previous year. It has also prepared charts, lantern slides, moving-picture films, and other material for the bureau's exhibit at the Panama-Pacific Exposition. Manuscripts for bulletins have been completed on the following subjects: A comparison of the Montessori method and the kindergarten; opinions as to the value of the kindergarten in children's homes, orphanages, and similar institutions; adjustments between the kindergarten and the first grade of the elementary school, including a study of double sessions in the kindergarten; and a survey of kindergarten training schools. A study has been made of the more important problems of kindergarten supervision, and the manuscript for a bulletin on kindergarten buildings and equipment is almost complete. Reading courses for kindergartners, teachers, kindergarten supervisors, and mothers are in preparation. In making some of these studies and in prepar-

ing some of these manuscripts, the division has had the cooperation of the International Kindergarten Union. In cooperation with a committee of this association the division made a preliminary study of the value of the kindergarten for young children as shown by its effect upon their habits of action, their mental attitude toward nature, society, play, and work, and their readiness of expression. A card catalogue of 10,000 kindergarten teachers has been compiled, a series of multigraphed letters to kindergartners has been begun, and three letters of the series have been circulated. The correspondence of this division from both the Washington office and the New York office continues to grow. This correspondence refers mostly to: Programs for State kindergarten meetings; lists of books on particular phases of kindergarten work; statements of reasons why the kindergarten should be a part of the public school system; the relation of the kindergarten to primary schools; length of the kindergarten term; tendencies in theory and practice of the kindergarten; and kindergarten legislation.

The chief of the kindergarten division addressed a series of meetings of the National Congress of Mothers and parent-teacher associations in the States of the Middle West and the Pacific coast and made addresses at St. Paul, Bismarck, Butte, Seattle, Portland, Burbank, San Bernardino, and San Francisco. At San Diego she attended a special conference of the board of education and others interested in the kindergarten. This division, chiefly through its New York office, has given much attention to kindergarten legislation. In its efforts to promote legislation it has corresponded with the State superintendents of public instruction and others interested in education in the States whose legislatures were in session within this fiscal year. In several of these States bills were introduced similar to the California law providing for the establishment of kindergartens upon the petition of parents. A law embodying this feature was enacted by the Legislature of Nevada, and the Legislature of North Carolina enacted the first kindergarten law of that State.[1]

A special collaborator of this division in California has visited many cities, attended educational conventions, addressed clubs, conducted personal interviews, and carried on extensive correspondence in behalf of the kindergarten. Largely as a result of her activities, 50 new kindergartens were established in the State before the close of the year.

The secretary of the kindergarten division attended the meeting of the National Education Association at St. Paul in July, the meeting of the Department of Superintendence of this association in Cincinnati in February, and has held conferences with cooperating committees of the International Kindergarten Union. She has also held

[1] The law is apparently inoperative, however, because of a technicality.

conferences with kindergartners at summer schools. Illustrated lectures on the kindergarten have been given at several schools.

Four additional sets of lantern slides have been put in circulation; the exhibit of kindergarten handwork has been shown at the University of Virginia and at Topeka, Kans.; speakers have been sent to several educational conventions; 58,300 pamphlets and circulars have been mailed to summer schools and educational meetings.

HOME EDUCATION.

The year has shown a very large increase in the work of the home education division, and many demands have been made upon it to which it has not been able to respond. The director of the division has attended many important conferences of parents, teachers, and others interested in the improvement of opportunities for education in the home and in the closer and more intelligent cooperation of home and school. Several of these conferences were called by the Commissioner of Education. In the spring of 1915 the director of the division made a tour across the continent conducting conferences and making addresses in many States. As a result of these conferences, many parent-teacher associations and other clubs have been formed for the purpose of promoting a greater interest in home education. In preparing for the Report of the Commissioner of Education a chapter on the condition and progress of home education in the United States, information was obtained from teachers in high schools, normal schools, and colleges, from settlement workers, pastors of churches, and State boards of health.

The correspondence has been very large. More than 12,000 pamphlets on the care and early education of children, and kindred subjects have been distributed. Home reading courses have been prepared as follows:

1. Literary Bibles.
2. World's great literature.
3. Parents' reading course.
4. Miscellaneous course for boys.
5. Miscellaneous course for girls.
6. Thirty books of great fiction.
7. American literature.

Of these a total of 26,568 copies have been distributed.

With the cooperation of the librarian of the children's department of the Boston Public Library, a selected list of 1,000 books for children's reading was prepared and printed.

Reading courses No. 1 and No. 2 were first sent out November 6, 1914, and the parents' reading course was sent out December 8, 1914.

When the bureau's limited editions of copies of some of these courses and of the list of 1,000 books for children were exhausted,

much larger editions were made available by the cooperation of the National Congress of Mothers.

The cooperation of the United States Public Health Service and of the American Medical Association has enabled this division to distribute many thousand copies of pamphlets on the care of babies. These have been sent upon request to mothers of young children, as well as to principals and teachers in high schools. Librarians in school and public libraries have given valuable assistance in bringing the reading courses to the attention of children and older people. From its small collection the division has lent copies of books on the care and education of young children to mothers in remote rural communities. There is great need for the extension of the work of this division, especially in rural communities where the people have until now received little benefit from many of the agencies of the Federal Government for helping the people to better living.

LIBRARY.

During the year the library division catalogued and classified 12,991 volumes, a larger total than in any previous year. This was made possible by using for personal service in the city of Washington a portion of the fund for the distribution of documents, as authorized by the appropriation act for the fiscal year, but this use of these funds caused a considerable reduction in the usual number of volumes acquired by purchase. The number of volumes and pamphlets acquired by gift, exchange, and purchase was 1,155; by transfer from the Library of Congress, 585; 8,000 numbers of serial publications and 8,081 numbers of periodicals were accessioned; 776 volumes were sent to the bindery. Additions were made systematically to the card index of articles on education in current periodicals and serial publications, both domestic and foreign; 200 bibliographies on special topics were compiled, and bibliographies already on file were revised and brought up to date. These bibliographies were copied, multigraphed, or printed as needed. The bureau now has on file for the use of school officers, teachers, and students of education, approximately 1,000 bibliographies on various subjects of education and school administration. Many hundred copies of these are sent out each year to those making special request for them. Ten numbers of the monthly record of current educational publications were prepared, and an index to the series for 1914 was compiled.

Loans from the library to institutions and individuals outside of the office amounted to 2,147 volumes; 2,870 letters asking for books or information were answered. The division compiled 16 pages of the Educational Directory.

The school library exhibit, prepared by this division last year, was exhibited at 12 national and State meetings of teachers and librarians in Minnesota, Tennessee, New York, Ohio, Indiana, Illinois, and Wisconsin, and there were many requests for it at other places.

EDITORIAL.

The editorial division supervised the publication of the two volumes of the Annual Report for 1914; 48 issues of the bulletin; and 168 miscellaneous publications, chiefly circulars of information of the brief letter type, ranging in size from 1 to 12 pages.

Annual Report.—Volume I of the Annual Report consists of 795 pages; Volume II, the statistical volume, consists of 562 pages. For the substance of these volumes reference is made to the table of contents. Volume I is a comprehensive, interpretative review of the progress of education in the United States and other culture nations of the world; Volume II consists almost entirely of statistics of schools in the United States.

Bulletin of the Bureau of Education.—Eleven of the bulletins (1914, Nos. 21, 26, 41, 42; 1915, Nos. 2, 3, 9, 10, 14, 15, 16) comprise the Monthly Record of Current Educational Publications and the index thereto. Bulletin 1914, No. 43, is the Educational Directory for 1914–15; 1914, No. 32, is a bibliography of secondary education in relation to higher education; 1914, No. 31, is the report of the work of the Bureau of Education in Alaska. The remaining 34 issues of the bulletin are special reports or studies in various fields of education, as follows:

1914, No. 12. Rural schoolhouses and grounds.
No. 13. Present status of drawing and art in the elementary and secondary schools of the United States.
No. 20. The rural school and hookworm disease.
No. 22. The Danish folk high schools.
No. 23. Some trade schools in Europe.
No. 24. Danish elementary rural schools.
No. 25. Important features in rural-school improvement.
No. 27. Agricultural teaching.
No. 28. The Montessori method and the kindergarten.
No. 29. The kindergarten in benevolent institutions.
No. 30. Consolidation of rural schools and transportation of pupils at public expense.
No. 33. Music in the public schools.
No. 34. Library instruction in universities, colleges, and normal schools.
No. 35. The training of teachers in England, Scotland, and Germany.
No. 36. Education for the home—Part I. General statement.
No. 37. Education for the home—Part II. State legislation.
No. 38. Education for the home—Part III. Colleges and universities.
No. 39. Education for the home—Part IV. Bibliography, list of schools.
No. 40. Care of health of boys in Girard College, Philadelphia, Pa.
No. 44. County-unit organization for the administration of rural schools.

1914, No. 45. Curricula in mathematics.
No. 46. School savings banks.
No. 47. City training schools for teachers.
No. 48. The educational museum of the St. Louis public schools.
No. 49. Efficiency and preparation of rural-school teachers.
No. 50. Statistics of State universities and State colleges.
1915, No. 1. Cooking in the vocational school.
No. 4. The health of school children.
No. 5. Organization of State departments of education.
No. 6. A study of colleges and high schools of the North Central Association.
No. 7. Accredited secondary schools in the United States.
No. 8. Present status of the honor system in colleges and universities.
No. 11. A statistical study of the public-school systems of the southern Appalachian Mountains (preliminary edition).
No. 12. History of public-school education in Alabama.

These bulletins vary in size from 16 to 376 pages; the average size is 76 pages. Twenty-six of the bulletins are studies of a descriptive type, the statistical element being absent or subordinated; three are statistical studies; and in five the descriptive and statistical elements are mingled.

Printed documents other than those in the bulletin series included: Annual statement of the Commissioner of Education, 1914; Parents' reading course, No. 3; 1,000 Good books for children; and reprints of the chapters in the Annual Report.

Bulletins still in the hands of the printer at the close of the year were as follows: Opportunities for foreign students at colleges and universities in the United States; Legislative and administrative control of school hygiene and sanitation; Civic education in elementary schools; The rural school system of Minnesota; The school system of Ontario; A statistical study of school conditions in the Appalachian Mountains (complete edition); The truant problem and the parental school; The training of elementary school-teachers in mathematics in Europe and the United States; A comparative study of the salaries of teachers and school officers; State *vs.* local control of elementary education; Adjustment between kindergarten and first grade; Extension of public education; Legal education in Great Britain; Secondary schools in the States of Central and South America and the West Indies; Statistics of libraries, 1913; Statistics of certain agricultural, industrial, and manual training schools; Mathematics in the lower and middle commercial and industrial schools; The schoolhouse as a polling place; Bibliography of education, 1911–12; Kindergarten training schools; and Open-air schools.

Circular-letter service.—The circular-letter service of the bureau has continued to develop during the year. The total number of copies of multigraph and neostyle letters delivered to the editorial division for distribution was 1,104,255, as compared with 700,000 the year before. This included 143,250 copies of statements issued for the

special information of the press, 215,520 letters over the commissioner's signature to school superintendents, high-school principals, and others, calling attention to various educational developments; and 174,735 blanks and questionnaires (not including the regular printed inquiries of the bureau). Of the remainder, 56,400 were copies of the rural school letter, intended especially for county school superintendents and rural supervisors; 91,900 were city school circulars distributed chiefly to city school superintendents and city or town boards of education. There were 10,500 higher education letters; 40,500 kindergarten letters; 55,500 legislative circulars; 108,250 civic education letters; 38,950 vocational education letters; 12,000 of a new series known as civic education for immigrants; and issues of 15,000 and 10,000, respectively, of a high-school letter and a home-education letter.

Distribution.—Considerable effort has been put forth during the year to simplify and strengthen the system of distribution of documents. At the present time a small general mailing list is maintained, chiefly of libraries, educational institutions, chief school officers, and a few special individuals who have legitimate use for all publications on education. To this list all bulletins of the Bureau of Education are sent as issued. In making up this general list the bureau tries to reach with all its publications those who are actually engaged in the training of teachers or who are in a position to help disseminate the information collected by the bureau. With the issue of bulletins restricted to 12,500 copies, it is possible to reach only a few such leaders in education. For the rest, classified mailing lists are maintained, and individuals desirous of being placed on these lists must indicate a special demand in one field of work. Special lists are maintained for agricultural and rural education, city-school administration, higher education, school hygiene, and industrial education. Of the 48 bulletins issued in 1914–15, county school superintendents received 11, or an average of about one a month; city superintendents in cities over 5,000 population received 12, and superintendents in cities and towns of less than 5,000 population, 7. Individuals and institutions on the special secondary list were reached 3 times with bulletins; school hygiene, 3 times; higher education, 8 times; school administration, 6 times; industrial education, twice; and rural and agricultural education, 10 times. By means of the bulletin series, in combination with the circular-letter service, active school officers were reached with definite information suited to their particular needs at least as often as once in every two weeks. The task of keeping these mailing lists in good order was made easier during the year by the creation of a general index for all names on the bureau address lists.

The specialist in foreign educational systems, who is attached to this division, prepared for the Report of the Commissioner of Education for 1914 the section on education in foreign countries. She also prepared a directory of foreign officers of education and a bulletin on secondary schools of the States of South and Central America and the West Indies, and has begun the compilation of comparative tables of educational statistics in foreign countries for the years 1900 to 1915.

The investigation of teachers' salaries reported upon last year has been continued this year in cooperation with the committee on teachers' salaries of the National Education Association. From January 1 to April 30, one clerk, and from May 1 to June 30 two clerks, were employed for this special work. The results will appear in a supplementary bulletin on teachers' salaries. Members of the editorial division cooperated in several other pieces of work not covered by the foregoing. Four of the chapters in Volume I of the 1914 report were compiled in the editorial division, exclusive of the matter furnished by the foreign specialist, mentioned above. Bulletin No. 34, 1914, was compiled by a member of this division.

STATISTICS.

The statistical division collected, tabulated, and summarized statistics for 544 pages of the second volume of the Report of the Commissioner of Education for 1914. This included statistical reports from approximately 21,000 schools and school systems as follows:

48 State school systems.
1,124 city school systems.
567 universities and colleges.
542 professional schools.
1,327 training schools for nurses.
281 normal schools.
704 summer schools.
11,515 public high schools.
2,199 private high schools and academies.
723 commercial schools.
360 schools for negroes.
112 State industrial schools and reformatories.
62 institutions for the blind.
151 institutions for the deaf.
63 institutions for the feeble-minded.

This division prepared about 130 pages of the Educational Directory for 1914–15 and compiled a bulletin giving statistics of 55 public manual training schools, 115 schools of agriculture, 309 technical and industrial training schools, and 1,414 public high schools having courses in agriculture, domestic economy, and other similar courses, and also

a bulletin of statistics of State universities and State colleges. It read the proof of the statistical volume of the report of the commissioner and approximately 1,000 pages of proof of statistical matter in various bulletins. It assisted the divisions of higher education, rural education, school administration, civic education, and kindergarten education in their statistical work. It furnished summaries for the statistical abstract published by the Department of Commerce, and prepared summaries and abstracts for publications and for several hundred school officers, teachers, and students of education.

Much of the time of this division was given to the correction of incomplete and inaccurate schedules returned by school officials. Because of lack of proper means of collecting statistics, much correspondence is necessary; more than 60,000 schedules must be sent in obtaining the 21,000 returns. There is much annoying and costly delay, and the final results are much less satisfactory than they should be.

Because of the delays in returns and of the lack of a sufficient number of clerks in this division, it is impossible to make progress in tabulating statistics before October, and to complete the work and get the manuscript for the statistical volume into the hands of the printer by the end of December. During the last months of the calendar year the division should have the services of twice as many clerks as it now has.

MAILS AND FILES.

The report of the mails and files division shows for the year:

Letters received	86,817
Forms received	86,272
Library publications received	74,000
Documents sent out	396,996
Multigraphed letters sent out	746,899

This does not include letters sent and received by field agents and by the officers of the Alaska division at Seattle and Nome; nor does it include the correspondence of the substations of the bureau in Philadelphia, New York, Chicago, and Nashville.

THE ALASKA SCHOOL SERVICE.

During the year the field force of the Alaska school service consisted of 5 superintendents, 1 assistant superintendent, 97 teachers, 7 physicians, and 8 nurses. Sixty-seven schools were maintained, with an enrollment of about 3,500. The schools on the shores of Bering Sea and the Arctic Ocean have not yet sent in complete reports.

In addition to maintaining schools for the native children in Alaska, the bureau has continued its endeavors in behalf of all people of the native communities by extending medical relief, by maintaining sanitary methods of living in the villages, by promoting the industries conducted by the natives, and by relieving destitution.

For a large part of the native population of Alaska the bureau has not yet been able to provide either schools or the means of caring for their health. This is especially true of the region between the Kuskokwim and the mouth of the Yukon, where there are six or seven thousand natives for whom little or nothing has been done.

More than $25,000 of the appropriation "Education of natives of Alaska" for the fiscal year ended June 30, 1915, was used in employing 7 physicians and 8 nurses; in maintaining improvised hospitals at Nulato, Kotzebue, and Kanakanak; in payments under contracts with St. Ann's Hospital at Juneau, with the Good Samaritan Hospital at Valdez, with the Holy Cross Hospital at Nome, with the Fairhaven Hospital at Candle, and with the Children's Orthopedic Hospital at Seattle, for the treatment of natives; also, as heretofore, in furnishing the teachers of the United States public schools with medical supplies and medical books in order to enable them to treat minor ailments. The efforts of the bureau to secure from Congress a specific appropriation to provide for the medical and sanitary relief of the natives of Alaska have met with partial success, $25,000 being granted for that purpose for the fiscal year 1915–16.

In order to replace the primitive methods of preserving fish and berries for winter use, steam home canning outfits for use in preserving fish and meat, as well as berries and vegetables, were sent to three of the largest villages during the summer of 1914. It is hoped that the use of such outfits will become general in the native communities.

According to the district superintendent, the income of the village of Atka has increased 150 per cent because of the establishment of a cooperative store, owned by the natives and managed by them, under the supervision of the teacher of the United States public school. The establishment of this store has resulted in obtaining articles of food and clothing at reasonable prices, in dividing among the natives themselves the profits which would otherwise go to white traders, and in the acquisition by the natives of self-confidence and experience in business affairs. The cooperative stores at Hydaburg, Klawock, Klukwan, and on St. Lawrence Island have also been successful.

In continuation of the policy of setting aside carefully selected tracts to which large numbers of natives can be attracted, within which, secure from the intrusions of unscrupulous white men, the natives can obtain fish and game and conduct their own industrial

and commercial enterprises, and within which the bureau can concentrate its efforts, reservations of a tract on the Kobuk River, in Arctic Alaska, and of a tract on the northern shore of Cook Inlet, including the village of Tyonek and its surroundings, were made by Executive order during the year. The reservation of the tract on the Kobuk River was made in compliance with the urgent request of the natives of Deering on Kotzebue Sound, who wished to migrate from the village which had been their home from time immemorial, because life in it had become increasingly difficult, since development of mining and the influx of white men had resulted in killing off game animals and in great scarcity of fuel.

In 1891, when setting apart Annette Island as a reserve for the use of the Metlakatlans and such other Alaskans as might join them, Congress empowered the Secretary of the Interior to prescribe rules and regulations for the reserve. This authority was not exercised, however, because it was felt that the advancement of the Metlakatlans could be secured best by allowing them to develop under the sole leadership of Mr. William Duncan, the founder of that unique colony. When it became necessary in the best interests of the Metlakatlans to establish and maintain a United States public school in Metlakatla, and otherwise to assume responsibility in connection with the interests of the Metlakatlans, it was deemed advisable to prescribe a code of regulations for the government of the colony, which was put into effect by the Secretary of the Interior January 28, 1915. Under these regulations the government of the Annette Islands Reserve is vested in an elective council of 12 members, with power to pass such ordinances for the local government of the reserve as are not in conflict with the laws of the United States, the laws of the Territory of Alaska, or the regulations prescribed by the Secretary of the Interior.

At its recent session the Alaska Territorial Legislature passed two acts of vital importance to the Alaskan natives. The act to define and establish the political status of Alaskan natives, approved April 27, 1915, provides methods for them to acquire citizenship. It empowers a United States judge to issue a certificate of citizenship to a native who has severed all tribal relations, adopted the habits of civilization, satisfied the teacher of a United States public school or of a Territorial or municipal school regarding his qualifications for citizenship, obtained the indorsement of his claim by five citizens, and secured the final approval of his application by the judge. The act to provide for local self-government in native villages in Alaska, approved April 21, 1915, permits a United States commissioner, after a proper hearing, to authorize the organization for self-government of any native village in Alaska having not less than 40 permanent inhabitants above the age of 21. The form of government is similar

to that prescribed by the Secretary of the Interior for the Annette Islands Reserve.

Expenditures from appropriation "Education of natives of Alaska, 1915."

Appropriation	$200,000.00
Salaries in Alaska	94,358.01
Equipment and supplies	15,498.15
Fuel and light	19,363.38
Local expenses	1,889.33
Repairs and rent	4,155.37
Buildings	14,475.06
Medical relief	25,584.80
Destitution	1,465.00
Commissioner's office salaries	4,870.17
Seattle office salaries	8,042.50
Commissioner's office expenses	125.00
Seattle office expenses	675.00
Traveling expenses	9,071.65
Contingencies	426.58
Total	200,000.00

THE ALASKA REINDEER SERVICE.

The latest complete statistics regarding the reindeer herds are those of the fiscal year ended June 30, 1914, according to which the total number of reindeer in Alaska was 57,872, distributed among 65 herds. Of this number, 37,828, or 66 per cent, were owned by 980 natives; 4,113, or 7 per cent, were owned by the United States; 5,924, or 10 per cent, were owned by missions; and 10,007, or 17 per cent, were owned by Lapps. The total income of the natives from the reindeer industry during the fiscal year, exclusive of the meat and hides used by the natives themselves, was $77,934. The total number of reindeer is a net increase of 22 per cent during the fiscal year, notwithstanding the fact that nearly 6,000 reindeer were killed for their meat and hides during the year.

The reindeer enterprise in Alaska has successfully passed through two stages—the introduction of the reindeer to a new country and people, and the development of an administration which has established the industry in the coastal region from Point Barrow to the Aleutian Peninsula. The result has been that the enterprise has been successfully commercialized and has advanced from a branch of industrial education to one of the industries of the country.

Realizing that the establishment of an export trade in reindeer products is essential to the success of the enterprise, the bureau is encouraging the shipment of reindeer meat and hides from Alaska to the States. The last steamer to leave Nome before the closing of navigation by ice brought to Seattle in October, 1914, 25 carcasses

of reindeer, which were placed on sale in Seattle, retailing at from 20 to 35 cents per pound. The chief of the Alaska division also brought from Nome 3 carcasses to be distributed among the five continental railway lines running out of Seattle in order that reindeer meat might be given a trial on dining cars, with a view to securing for the natives contracts for the delivery of reindeer meat each season.

During the winter of 1914–15 the bureau's superintendent stationed at Nome, with the approval of the Commissioner of Education, distributed among the Eskimo herders in northwestern Alaska a proposal from a cold-storage company operating between Seattle and Nome to market in Seattle for the Eskimos, on a commission basis, the reindeer meat consigned to that company. This action will probably result in the shipping of a considerable quantity of reindeer meat from Nome during the summer. The responsibility of accepting or rejecting the proposal of the cold-storage company will rest with the native owners of the reindeer, while the superintendents of the bureau act in an advisory capacity and assist in making the necessary arrangements.

Soon after the inception of the reindeer enterprise certain Lapps were brought from Lapland to Alaska and employed by the bureau as instructors of the Eskimos in the care and management of the reindeer. Each Lapp received a certain number of reindeer in payment for his services. During the summer of 1914 a company organized at Nome purchased about 1,200 reindeer from one of these Lapps. This company intends to purchase other herds now owned by Lapps, and to engage in the exportation of reindeer meat and hides.

Under the supervision of the superintendent of the northwestern district a very successful convention was held at Igloo January 11–17, and was attended by about 200 of the Eskimos engaged in the reindeer industry on the Seward Peninsula. The main object of the convention was the exchange of experiences and opinions on matters connected with raising and utilizing reindeer. The discussions included such subjects as the best way to slaughter a reindeer and prepare it for market, the most satisfactory forms of sleds and harness, and the best methods of driving reindeer. There were also shooting matches, rope-throwing contests, wrestling bouts, and many kinds of races with reindeer. The exhibits included sets of harness, sleds, halters, and clothing made of reindeer skin, for which prizes were awarded. The success of this convention will probably result in holding similar conventions annually in various centers of the reindeer industry.

The reindeer industry is now extending from the mainland to the outlying islands. During August, 1914, upon request of the Depart-

ment of the Interior, the revenue cutter *Manning* conveyed a herd of 40 reindeer from Ugashik, on the Alaska Peninsula, to Atka, a remote island in the Aleutian chain, where it will be a valuable factor in alleviating the deplorable conditions which have hitherto prevailed upon that desolate island. The extension of the reindeer industry into southeast Alaska was begun during October by shipping to Metlakatla, on Annette Island, 8 reindeer from the herd in the vicinity of Nome.

Expenditures from appropriation for "Reindeer for Alaska, 1915."

Appropriation		$5,000
Salaries of chief herders	$500	
Supplies	3,850	
Establishing new herds	650	
Total		5,000

COMMISSIONER.

The commissioner has continued his policy of attending meetings of the more important National, sectional, State, and local associations interested directly or indirectly in education and of visiting and inspecting schools of all kinds and grades, to the end that he may have first-hand knowledge of educational policies and practices in all parts of the country, understand better the attitude of educators, and bring the bureau and those whom it serves closer together. In doing this he has traveled approximately 70,000 miles, visited 27 States, and made more than 200 addresses. Within the four years during which the present commissioner has been in office he has visited all but four of the States of the Union, most of them many times, and Porto Rico and Alaska. Within the year he has called nine special conferences, six of which he has attended and directed.

MISCELLANEOUS.

The number of special collaborators serving the bureau at the nominal sum of $1 a year has increased within the year from 118 to 122. These special collaborators are attached to various divisions of the bureau or work under the immediate direction of the commissioner. Some are attached to the staff of one or the other of the substations; 12 have desks in the office at Washington a part or all of the year; one is in the office of the home education division in Philadelphia, and one in the office of the kindergarten division in New York. All these assist in making investigations, preparing reports, conducting correspondence, holding conferences, and in other ways. Other special collaborators render much valuable service in making educational surveys, in conducting special studies, in gath-

ering information, in compiling bulletins and reports, in formulating expert opinion and giving advice, and in representing the bureau at important meetings. The service rendered by these special collaborators, at a total cost of $122, is probably equal to what could be obtained otherwise only by an additional appropriation of $35,000 or $40,000 for the payment of specialists and clerks.

The efforts of the commissioner to obtain for the bureau the hearty cooperation of educational associations, boards of education, and education officers and teachers, mentioned in the commissioner's statement for the year ended June 30, 1914, have been continued with gratifying success. It is quite evident that when the bureau has more strength within itself, so that it can give better direction in more lines of work and direct more effectively in those lines it has already undertaken, this cooperation will become still more valuable. That this bureau and bureaus in other executive departments at Washington may cooperate helpfully is shown by plans of cooperation which have been worked out by this bureau and the Division of Agricultural Education in the Department of Agriculture, the Children's Bureau and the Bureau of Immigration in the Department of Labor, and the Public Health Service.

At the request of the President this bureau has undertaken to cooperate with the Children's Bureau and the Public Health Service in a study of exceptional children and the means of their care and education. Two or three conferences have been held, but little progress has been made, chiefly because of the fact that this bureau has no specialists in this very important phase of education. As soon as the bureau can have such specialists, the work will be carried forward. It is of very great importance that there should be a better understanding of this subject, which affects two or three millions of children who can not be helped much by the usual means and methods of education, and which must have interest for society as a whole.

Within the year plans have been worked out by which this bureau will cooperate with education officers and others in the State of Delaware in making a complete survey of educational conditions and of all the educational agencies, public and private, in that State, and in working out and putting into operation plans for a closer cooperation of all these agencies, and for a system of education in the State as nearly as possible ideal. All public officials of the State, including the governor, who is taking an active interest in the matter, are giving their hearty support. The Department of Agriculture of the United States, the Children's Bureau, and the Public Health Service are cooperating with this bureau in this work. The State of Delaware offers peculiar advantages for a cooperative work of this kind. The results of the work will no

doubt extend to some extent to all the States. I believe this is one of the most important projects this bureau has ever undertaken.

With the cooperation of the Department of Agriculture and the assistance of Mr. George N. Briggs, whose salary and expenses were paid by the Government exposition board, the bureau prepared and installed in the Panama-Pacific Exposition at San Francisco an exhibit showing the activities of the bureau, the present status and recent progress of education in the United States, the work of colleges of agriculture and mechanic arts, and certain phases of recent improvement in rural schools and of the work of schools for Negroes. The commissioner assisted in working out plans whereby the exhibits of the several States, cities, and educational institutions participating in the exposition avoided unnecessary duplication and succeeded in making a more or less unified and comprehensive exhibit of the best in education in the country as a whole.

All the needs of the bureau set forth in the statement of the commissioner for the year ended June 30, 1914, still exist, and I beg leave to submit again, with slight modifications, the recommendations submitted in that statement.

RECOMMENDATIONS.

(1) An increase in the salaries of chief clerk, editor, statistician, specialist in land-grant college statistics, specialist in higher education, and other specialists, and the removal of the limit on amount of salaries which may be paid from the lump-sum appropriation for rural school education and industrial education. The duties of these positions require the services of men and women of such kind and degree of ability as demand salaries considerably higher than are now paid in this bureau. I can only repeat what I said in my statements for 1913 and for 1914, that work of this kind had better not be attempted than not done well.

(2) An assistant commissioner, who should also be a specialist in secondary education and should serve as chief of a high-school division of the bureau. The duties of the office make it necessary for the commissioner to visit distant parts of the country and to be absent from the office frequently many days at a time. There should be an assistant commissioner to carry on the work in the office. The increased work in the office demands much more of the commissioner than was demanded formerly. Probably the most important phase in public education in the United States at present is that of the secondary schools. The high school is, or should be, the heart and center of our school system. The problems of the high school are more difficult and their solution more urgent than those of any other part of the school system. The head of the high-school division of

the bureau should therefore be a man of great ability. By combining the offices of assistant commissioner and of specialist in secondary education, it should be possible to pay a salary sufficiently large to obtain the services of such a man.

(3) Additional specialists in higher education, including education in universities, colleges, schools of technology, schools of professional education, and normal schools. There is special need of an able man, familiar with agricultural education and the problems of Negro education in the South, to devote his entire time and attention to the colleges of agriculture for Negroes in the Southern States.

(4) Additional specialists in school and home gardening. The proper education of many millions of children, and even the possibility of their attending school at all during the years in which attendance at school is most valuable, depend to a very large extent upon the general adoption of the work which the bureau is promoting through this division. It is very important that there should be in the bureau a sufficient number of specialists in this subject to visit all cities, towns, and manufacturing villages in the country, advise with their school officials and teachers, and assist in directing the work of teachers until the plan is well enough understood and there are enough trained teachers that work in any city or town may go on without outside direction, or until the several States have made provision for the direction of the work from their offices of education.

(5) An increase in the number of specialists and assistants in rural education and industrial education. The appropriation for salaries and expenses in these subjects for the current year is $30,000. With this it is impossible to obtain the services of more than eight specialists and assistants and have a sufficient amount left to pay the necessary traveling expenses. There is urgent need for not less than three times this number of men and women for this work.

(6) The formation of a division of commercial education, with specialists and assistants, for the investigation of problems of commercial education and to assist in making plans and finding means for the preparation of our young people for participation in the larger commercial life upon which the country is now entering.

(7) More adequate provision for the investigation and promotion of school sanitation and hygiene. Nearly 20,000,000 children spend a good part of their time each year in public and private schools in the United States. They come to these schools that they may gain preparation and strength for life. In many of the schools the heating, lighting, ventilation, and other means of sanitation are so poor that instead of gaining strength for life they have the seeds of disease and death sown in their systems. In many other schools the daily regimen is such as to cause the children to lose a very large per

cent of that which they might gain with a better regimen. From State, county, and city school officers, in all parts of the country, thousands of requests come to the bureau for information and advice in regard to these matters. The bureau should be able to give accurate information and sound advice regarding various phases of this subject. The establishment of health and right health habits must be considered a most important and vital principle in any education that is to fit for life.

(8) The formation of a division, with a group of able specialists and assistants, for the investigation of problems of education and school administration in cities and towns. The drift of population to the cities and towns continues, and the proportion of urban population to rural population is increasing rapidly. Almost one-half of the children in the United States now live in cities, towns, and densely populated suburban communities. In some sections of the country a very large proportion of these children are the children of foreign-born parents. All this adds to the complexity and difficulty of the problems of city school administration, especially in the larger cities. Many hundreds of requests for advice and information in regard to these problems come to the bureau every year. At present there is no one in the bureau whose special duty it is to respond to them.

(9) The establishment of a division, with specialists and assistants, for the investigation of the education of exceptional children. There are in the United States more than 2,000,000 children whose education requires means varying widely from those in common use for the education of normal children. These children are to be found in cities, towns, and rural communities alike, and all school officers and teachers have to deal with them. The Bureau of Education can not be considered as performing its duties to all the population with impartiality until it has in its service men and women who can give accurate information and helpful advice in regard to the education of these children.

(10) Provision for the investigation of the education of adult illiterates and the dissemination of information as to the best methods of teaching illiterate men and women to read and write, and of extending the meager education of those who were denied the advantages of the schools in their childhood and youth. According to the census of 1910 there were in the United States more than 5,500,000 illiterate men and women and children over the age when they may be expected to make a beginning in the public schools, and there were many millions more barely able to read and write. This illiteracy is a burden to society and to State and Nation. Within the past few years considerable interest in the removal of this burden has developed. It is believed that States, local communities, indi-

viduals, and benevolent societies would heartily cooperate in any reasonable plans which might be devised and presented by this bureau for this purpose.

(11) A careful and thorough investigation as to the means of better education of children in their homes, and the dissemination of information as to the best methods for the early physical, mental, and moral education of children in the home, and for the better cooperation of home and school in the education of children of school age. Children of the United States are in school less than 4 per cent of their time from birth to 21. The home is the primary and fundamental educational institution. Schools and other agencies are only secondary. If education in the home fails, no other agency can make good the failure. With our changing civilization and social and industrial life, there is need of more careful study of education in the home. The bureau has already made a beginning in this work, but there is need of far more than it can hope to do without much larger equipment for it.

(12) A specialist in educational theory and practice, to serve as a director of investigations in education, assisting National, State, and local committees and commissions and making available for them the large collections of material in the library of the bureau and elsewhere in Washington. National, State, and local associations appoint many committees, and States and cities appoint many commissions to investigate and report on various problems of education. Many of these committees and commissions fail more or less completely for want of material and intelligent assistance and direction. The library of this bureau, one of the most complete of its kind in the world, contains a large collection of material for most of these investigations. The specialist here recommended could put this collection at the service of these committees and commissions and at the same time give much-needed assistance and direction. His services would also be valuable to other specialists in the bureau and to hundreds of individual students of education upon whose investigations the country depends for most of its knowledge of education.

(13) An assistant editor. The editorial work of the office has increased more than fivefold within the past four years, and it must increase still more within the next year. It is now impossible for one editor to perform satisfactorily all the required editorial work.

(14) A specialist in foreign and domestic systems of education and an assistant in foreign systems of education. This bureau is undertaking to keep the people of the United States informed as to all important progress in education and in methods of teaching in all countries of the world. It must have, in order to accomplish this work with any degree of satisfaction, the additional assistance here indicated.

(15) Two additional collectors and compilers of statistics. Material for prompt and reliable statistical reports can not be had by this bureau without frequent visits to State and city education offices and the first-hand study of their returns. This is not possible with the force the bureau now has for this work.

(16) Additional clerks, copyists, laborers, and messengers to correspond with the increase made possible by additional specialists.

(17) An increase of appropriation for traveling expenses for the commissioner and employees acting under his direction. This is necessary to enable them to make original investigations in education in different parts of the country and to disseminate information by meeting with educational associations and other societies interested in education in different parts of the country, which is the most effective means for the dissemination of such information.

(18) Means to enable the bureau to cooperate with schools of education in colleges and universities, with normal schools, and with city school systems in making important investigations and definite experiments in elementary and secondary school education under scientific control. With a comparatively small amount of money the bureau might obtain the cooperation of individuals, institutions, and boards of education in making important investigations and experiments in education not otherwise possible without much larger expenditures.

(19) A larger appropriation to enable the Secretary of the Interior, in his discretion and under his direction, and with the advice and cooperation of the Public Health Service, to provide for the medical and sanitary relief of the Eskimos, Aleuts, Indians, and other natives of Alaska. Careful investigations made with the cooperation of the Public Health Service have shown the necessity of immediate provision for the care of the health of the natives of this Territory and for the eradication of communicable diseases now prevalent in different sections of the Territory which, if not put under immediate control, will soon destroy the lives of many of these people and spread among the white settlers. From year to year this bureau has used an increasingly large proportion of the appropriation for the education of the natives of Alaska for medical attendance and for general sanitation. To do this it has had to close schools in several villages and to withdraw from these villages all influences for the civilization and improvement of the people. This should not be continued longer, but until special funds in adequate amount are appropriated for medical attendance or the appropriation for education largely increased, the bureau can not provide adequately for the education and the care of the health of these people. Elsewhere attention is called to the fact that for six or seven thousand natives in the Yukon-Kuskokwim region this bureau has done very little.

(20) An increase of $1,000 in the appropriation for the distribution of reindeer in Alaska. The Alaska reindeer service, which was begun in a small way a little more than 20 years ago, has now reached large proportions, and has accomplished much for the support and for the education and civilization of the natives in the northwestern part of the Territory. The bureau wishes to extend at once the distribution of reindeer in the sections in which reindeer may be herded profitably, to give all the natives of this section the advantage which has already come to those living in settlements to which reindeer have been sent, and to complete this work so there may not be need for a continuation of the appropriation for this purpose.

To enable the bureau to perform satisfactorily the function for which it was created and to respond to the demands for a clearing house for accurate information, well-matured opinion, and sound advice in regard to all phases of education and for assistance in promoting democratic education throughout the country, there will be need in the near future for an annual income of a half million dollars and for an education building with ample room for the library of the bureau and a complete educational museum in which school officers, teachers, and students of education may find, properly arranged and catalogued, typical specimens of all forms of school furniture and equipment, with outlines of courses of study and whatever else will enable them to gain a comprehensive view of purposes, methods, and results of education in this and other countries and assist them in forming ideals for the improvement of their own schools and work. This will enable the bureau to respond to its part of the demands the States and the people have a right to make of the Federal Government, which was created to serve States and people in those things in which they can not otherwise serve themselves at all, or so well, or only at such cost as would be prohibitive or unnecessarily burdensome. I recommend the immediate consideration of plans for this extension of the bureau.

Respectfully submitted.

P. P. CLAXTON,
Commissioner.

The SECRETARY OF THE INTERIOR.

REPORT OF THE DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY.

REPORT OF THE DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY.

GEORGE OTIS SMITH, *Director.*

The appropriations for the work of the United States Geological Survey for the fiscal year 1914–15 comprised items amounting to $1,620,520. The plan of operations was approved by the Secretary of the Interior, and a detailed statement of the work of the several branches and divisions of the Survey is presented on later pages of this report.

SPECIAL FEATURES.

A LARGER PUBLIC SERVICE.

In the last decade the United States Geological Survey has largely increased its return to the public, both in amount and in variety of service rendered. The statement was made in this report a year ago that never before had the general public been in closer touch with this Survey or made larger use of the results of its scientific investigations. The recognition by citizens generally that the Geological Survey is a bureau of information as well as a field service has gradually placed upon it a large burden of work as well as of responsibility. The amount of correspondence involved in performing this public duty may be indicated by the fact that approximately 50,000 letters of inquiry were handled in the different scientific branches of the Survey last year. The scope of these inquiries is not less noteworthy, for they range from requests for information concerning the geology of every part of the United States or the water supply, both underground and surface, of as widely separated regions as Alaska and Florida, or for engineering data on areas in every State in the Union, to inquiries regarding the natural resources of foreign countries, especially those of Central and South America.

The changes in the world's trade in metals and other mineral products during the last year brought to the Geological Survey a new opportunity for special service. The inquiries concerning possible sources of this or that mineral product began early in August, and the Secretary of the Interior gave to the public an interview outlining the expected developments in the mineral industry. His

statement was followed by special press bulletins issued by the Survey on the more important subjects. In September, however, the demand for authoritative information had become so lively that a bulletin—"Our mineral reserves" (Bulletin 599)—was quickly prepared and issued without delay. In this publication the whole subject of the country's ability to meet the emergency demands for minerals was summarized and the Survey offered to serve as an agent in bringing consumer and producer into touch with each other. This new function of acting as "central" to the mineral industry proved popular, a large volume of special correspondence developed, and a gratifying use was made of the Geological Survey's list of mineral producers and of the specific information in the possession of the Federal geologists regarding practically every type of mineral deposit in the country. It is believed that this correspondence has been of material advantage to consumers and producers alike—the users of mineral products who were formerly dependent upon foreign sources of supply and the mine operators who have learned of new markets for their output.

The preparation of this special information to meet a new public demand, together with the continued task of replying to requests for specific information, has resulted in placing fresh emphasis on this phase of the work of the Geological Survey. The rendering of such service is in itself instructive to those charged with the duty, and the Survey staff has acquired a keener realization of the need not only of giving the facts to the public, but also of making those facts intelligible and useful to the citizen who lacks professional training in geology or engineering. Two obligations are thus laid upon the Government scientist—first, that of making his investigations more and more exact in method and more definite in result; second, that of transmitting the product of his investigations in a form to meet the needs of not only his professional associates but of the general public. Most scientists in the public service should aspire to the translation of their own reports into the language of the people.

The Survey as the center of public information concerning the geology of the United States bears an educational obligation to the public. It has so far, in part, neglected its opportunity as well as its duty as an investigative branch of the Government to furnish popular information of an instructive type regarding this most enlightening science. In recognition of this educational responsibility and of the importance of making its work more generally intelligible and useful to the private citizen who has not been geologically educated, several members of the Survey have of late given more attention both to the simplification of the language of the professional publications and to the preparation of reports that are popularly descriptive and instruc-

tive, yet also exact and efficient as vehicles for professional discussion or for the announcement of geologic discoveries.

Conforming to this growing conviction, the Survey has printed on the backs of several of its topographic maps nontechnical descriptions of the physical features of the area mapped and of their origin. The evident appreciation by the general public of such explanations of the geologic features as shown by the increased demand for the maps has encouraged the extension of the practice. Accordingly, after the publication of such matter for the map of the Crater Lake National Park, Oregon, the Bright Angel area, in the Grand Canyon of Arizona, has similarly been described, and descriptions for other areas, including the Delaware Water Gap, in Pennsylvania and New Jersey, are now being prepared. This work is a by-product of the geologic mapping and therefore involves comparatively little expense, but it adds greatly to the general interest and educational value of the topographic maps.

Survey geologists have prepared guides covering the points of scenic or unusual geologic interest in the Glacier National Park and in the Mount Rainier National Park, which were published as small brochures for distribution from the office of the Secretary of the Interior, and now the compilation of more elaborate and comprehensive accounts of the geography and the origin of the principal geologic features in several of the national parks has been undertaken for publication as bulletins of the Survey. "The Glacier National Park, a popular guide to its geology and scenery," by M. R. Campbell, has been issued within the year as Bulletin 600. An illustrated guide containing descriptions, with maps, of the geology and of the origin of the striking physical features in the Yosemite Valley of California, with a study of the glaciation, is now being prepared in popular language by F. E. Matthes and F. C. Calkins and will probably be published at an early date as a bulletin. The Mesa Verde National Forest is to be similarly described and illustrated by A. J. Collier, the preparation of whose matter has, however, been necessarily interrupted by work in land classification.

A more ambitious project was undertaken this year. Mindful of the great numbers of educated and intelligent tourists, both American and foreign, who were likely to visit the Pacific coast during the exposition year, and painfully aware of the lack of satisfactory guidebook descriptions, with adequate and accurate maps, covering the physical features of the regions traversed by the greater number of the exposition visitors, the Survey determined to give the public the benefit of a portion of the wealth of geographic and geologic information in its possession, through the publication of guidebooks to the geography, geology, mineral wealth and other natural resources, industries, and history of the regions bordering several of the trans-

continental routes. The small amount of money that could be devoted to this project without sacrifice to the public welfare in other lines of Survey work of more importance though of less popular interest made it practicable this year to undertake the preparation of only four such guides, as follows:

The Northern Pacific Route, from St. Paul to Seattle, with a side trip to the Yellowstone National Park (Bulletin 611).

The Overland Route, from Omaha to San Francisco, with a side trip to the Yellowstone National Park (Bulletin 612).

The Santa Fe Route, from Kansas City to Los Angeles, with a side trip to the Grand Canyon of the Colorado (Bulletin 613).

The Shasta Route and Coast Line, from Seattle and Los Angeles to San Francisco (Bulletin 614).

The first of these books, that describing the Overland Route, was issued in June, and the others followed in July, August, and September. These books inform the traveler concerning the great West, its features and its resources, as well as unfold to him in attractive form its fascinating geology. The method adopted is to entertain the traveler by making more interesting what he sees from the car window, to guide his eyes toward the more important or essential things within his field of vision, and then to have much that he sees explained by what is unseen in the swift passage of the train. The magnificent illustrations of the great principles of earth evolution seen along the route are used to teach some of the principles of geology; and fragments of the story of the past are narrated to enable him to interpret the present. As stated in the preface of these volumes—

The plan of the series is to present authoritative information that may enable the reader to realize adequately the scenic and material resources of the region he is traversing, to comprehend correctly the basis of its development, and above all to appreciate keenly the real value of the country he looks out upon, not as so many square miles of territory represented on the map in a railroad folder by meaningless spaces, but rather as land—real estate, if you please—varying widely in present appearance because differing largely in its history and characterized by even greater variation in values because possessing diversified natural resources. One region may be such as to afford a livelihood for only a pastoral people; another may present opportunity for intensive agriculture; still another may contain hidden stores of mineral wealth that may attract large industrial development; and taken together these varied resources afford the promise of long-continued prosperity for this or that State.

Items of interest in civic development or references to significant epochs in the record of discovery and settlement may be interspersed with explanations of mountain and valley or statements of geologic history. In a broad way, the story of the West is a unit, and every chapter should be told in order to meet fully the needs of the tourist who aims to understand all that he sees. To such a traveler-reader this series of guidebooks is addressed.

Somewhat related to the more distinctly educational reports already described are two bulletins—"The data of geochemistry" (Bulletin 491), by F. W. Clarke, and "Useful minerals of the United

States" (Bulletin 585), compiled by Samuel Sanford and R. W. Stone. A third edition of the former (Bulletin 616) and a revision of the latter, much enlarged by F. C. Schrader, with a glossary showing the composition and character of each mineral (Bulletin 624), are now in course of publication. The editions of these handbooks of general information on broad subjects are rapidly exhausted.

The special efforts of the last year to reach the public with these more popular publications are intended as the beginning of a movement to popularize further the results of scientific investigations. Both the opportunity and the duty of the United States Geological Survey to furnish scientific information in popular form are appreciated.

DEMAND FOR GEOLOGIC WORK.

Especially noteworthy among the features of the year's work is the great increase in the demands made on the Federal geologists for specific investigations of an economic nature. The requests have touched all lines in the geologic province, but most of them ask for the examination of reported discoveries of potash or nitrate salts; for the study of the ore deposits in metal-mining districts, newly discovered or old; or for the investigation of the geologic structure in many regions, with a view to the discovery of areas that may be regarded as structurally favorable for the occurrence of oil or gas pools.

The calls from many States for examinations as to the possibilities of finding oil in untested regions have been nearly as numerous as all others combined, applications for classification of public lands excepted. In this field of applied geology especially the Geological Survey is coming more and more to be regarded as the consulting geologist for the public. Many of the great oil companies, recognizing the paramount value of a knowledge of the geologic structure in the guidance of oil exploration and development, have secured the exclusive services of geologists trained in oil geology. These strong corporations, most of which have lured away from the Survey a number of its best men, are able to organize geologic corps for themselves and to examine geologically great areas of unleased and untested lands in order more certainly to select the sections in which, other things being equal, the prospects for pools are most favorable and the hazards of dry holes the least. But these corporations rarely publish the original information gained by their geologists, and, whether or not the company is able to obtain all the lands it desires, the public is seldom much the wiser for these investigations at private expense.

The appeals to the Survey come mainly from citizens and landowners singly and in groups, from chambers of commerce, and from delegations and communities. The Geological Survey is, by its

organic act, forbidden to make and therefore does not make examinations of private lands primarily in behalf of their owners, whether the owners are individuals or corporations. Its examinations are regional in extent, without regard to ownership, and when confined to small areas they are conducted without reference to property lines and with regard only to the geologic problems in hand and to the interests of the community and the Nation in the development of the mineral resources in the vicinity or district. In strict conformity with this principle, the results of all examinations and investigations are withheld until they are printed, either as press notices or as more formal reports, and in these forms they are simultaneously given out to all who ask for them.

Both through its own resources and through the cooperation of State surveys, the Federal Survey greatly extended its examination of oil structure during the year, and the results will be found in its current economic bulletins and in State reports. Yet in this field, as well as in others, the increase in extent and efficiency of the work made possible by the larger funds provided by Congress for this year has been insufficient to warrant attention to any except the most urgent calls on this national bureau for information regarding the geology of the country and for guidance in the discovery and development of its mineral resources. The increase both in the number and in the range of these calls is, in effect, proof of the public's growing appreciation of the value of the Survey work.

A CONTRIBUTION TO PUBLIC HEALTH.

The geologic resource of greatest value to the health of communities is a supply of pure drinking water. It is generally recognized that a number of diseases, prominent among which are typhoid fever and amœbic dysentery—a disease more common in tropical climates but found also in the United States—are contracted through contaminated water or contaminated food. Therefore a supply of pure water will eliminate one of the sources of such infection.

It is highly desirable to obtain supplies of domestic water from sources other than the shallow wells, some of them open, that are found near many houses. The water obtained from deep wells has percolated through sands and other material for so great a distance that its impurities have been removed by filtration, and it possesses a sanitary value that can not well be overestimated, for such water is free from the bacteria causing typhoid fever and the protozoa causing amœbic dysentery, and its use obviates the necessity for shallow wells that may serve as a breeding place for Anopheles, the mosquito to which malarial infection is due.

The United States Geological Survey for a number of years has been prosecuting, largely in cooperation with the State surveys, a

systematic study of the ground-water resources of all the Coastal Plain States. Reports have been issued, either by the Federal Survey or by cooperating State geological surveys, for Virginia, North Carolina, Georgia, Florida, Alabama, Mississippi, eastern Tennessee, Kentucky and southern Illinois, southeastern Missouri, southeastern Arkansas and Louisiana, northeastern Texas, the Black and Grand Prairie areas of Texas, and the area underlain by Tertiary formations in Texas south of the latitude of Jéfferson and east of Brazos River. The manuscripts of papers on the ground-water resources of Delaware and Maryland, on the ground waters of northeastern Arkansas, and on the ground waters of Lasalle and McMullen counties, Tex., have been completed and will be published during the next fiscal year. Additional studies of the ground waters of Mississippi are in progress and it is hoped that within the next year the manuscript will be transmitted for publication. Comprehensive studies of the ground-water resources of the Coastal Plain of Texas west of Brazos River are approaching completion, and the manuscript of a report will be submitted for publication within a year.

With good health recognized as one of the great national assets, the extent of this study of underground-water resources furnishes a measure of its value to the public. Reports have been published covering 376,000 square miles in the Atlantic and Gulf States, reports on 27,000 square miles are completed though not yet published, field work has been completed on 50,000 square miles, and work is contemplated to cover 16,000 square miles. These areas of nearly half a million square miles include the parts of the United States in which impure water supplies involve the greatest danger. The value of such surveys in conserving public health has already been demonstrated, for it has been noted that wherever an adequate supply of deep-well water has been obtained, typhoid fever, amœbic dysentery, and malaria have abated.

The methods used by geologists in working out the distribution of ground waters are complex, but it is noteworthy that among the more significant criteria used are the fossil remains occurring in the different beds. Each one of the geologic horizons usually has its distinctive fossils, and by an accurate knowledge of these vestiges of organisms the geologist is aided in recognizing particular geologic formations. In this way he may be able to determine by means of the samples taken from the bore the depth to a certain water horizon.

That paleontology, so generally regarded as a purely scientific study, has a great value in the investigation of economic resources may not be generally recognized. In order, however, to understand the conditions controlling the occurrence of any one of three of the most important mineral resources—ground waters, coal, and oil and gas—an accurate knowledge of the succession of the different

rock sheets and their geologic structure is essential, and the determination of that order of succession depends upon the study of fossil remains included in these rocks. The value of the work of the paleontologists who have studied the geologic formations in the Coastal Plain area is therefore inestimable. Among the men who have aided in the paleontologic characterization of horizons and thereby assisted in the development of the ground water and oil and gas resources of the Coastal Plain, W. H. Dall, G. D. Harris, and R. T. Hill should be specially mentioned. The excellent work of these scientists has been continued either by themselves or by others who have entered the same fields, and it is hoped that within a few years there may be available biologic characterizations of all the Tertiary and Cretaceous formations of the Coastal Plain. Additional accurate information will assist in the further development of many of the natural resources of the Coastal Plain region.

It is unfortunate that the paleontologists are subjected to increasing overwork, and it is to be regretted that on account of inadequate funds the distinguished Survey specialists engaged in these important studies, which are particularly in demand by the cooperating State surveys, can not be provided with assistance.

It should be added that the science of paleontology has a large educational value, and its popular interest is well illustrated in the western guidebooks, just published. As with geology in general, so in paleontology, the Survey is the central public source of information.

CHANGES IN PERSONNEL.

The death of Henry Gannett, on November 5, 1914, terminated a long and important service. Mr. Gannett was connected with the Survey, with a few interruptions, since 1882 and accomplished much in establishing the methods and fixing the standards of the topographic work in the early days of the organization. He held the title of chief geographer (or chief topographer) in the years 1882 to 1896. His Government work outside of the Survey, chiefly work on the census of the United States, Cuba, Porto Rico, and the Philippines, and his services as chairman of the United States Geographic Board and as geographer of the National Conservation Commission, covered a wide field of geographic investigations and showed large grasp of new problems. He was also president of the National Geographic Society.

Among the important resignations or transfers from the Survey within the fiscal year were those of David T. Day and E. W. Parker. These two men are to be credited with the development of the division of mineral resources, a service that is unique among the statistical organizations of the world. Dr. Day, after a service of nearly 30 years, was transferred August 31, 1914, to the Bureau of Mines,

where, as consulting chemist, he will continue his investigation of the special problems connected with the technology of petroleum, devoting part of his time to this Government work. Mr. Parker, who served in various positions in the Survey since 1891 and who has been in charge of the collection of statistics of the mineral resources of the United States since 1908, resigned June 30, 1915, to accept an important position with the anthracite-coal interests. Mr. Parker's resignation necessitated several changes in the division of mineral resources—the appointment of Hiram D. McCaskey as geologist in charge, of E. F. Burchard as geologist in charge of the section of nonmetallic resources, and of C. E. Lesher, associate geologist, to take charge of the statistics of coal. The number of men designated to take up the work relinquished by Mr. Parker is perhaps the strongest indication of the amount and importance of that work, which he so long successfully carried on.

Mr. E. C. Barnard, geographer, resigned May 2, 1915, after a service of more than 30 years, to accept the position of expert commissioner on the part of the United States in the International Boundary Commissions (Canada). Since 1910 Mr. Barnard's connection with the Geological Survey has been only nominal, by reason of his detail to the State Department in connection with the surveys of the international boundary.

Other changes in the organization were the appointment, in January, of Philip S. Smith as administrative geologist and, in the absence of the Director, Acting Director, and the appointment, in February, of Guy E. Mitchell as chief of the executive division. Mr. Mitchell was succeeded by T. P. O'Hara as private secretary to the Director.

EXHIBIT AT PANAMA-PACIFIC EXPOSITION.

With a small allotment from the congressional appropriation for the Government exhibit at the Panama-Pacific Exposition, San Francisco, the Survey has made a creditable and instructive exhibit, including scenarios showing many of the kinds of work done by the Survey in exploring and investigating the resources of the country; an exhibit of the per capita production of minerals of the United States; an exhibit of the use of many of the minerals in the rough and in the manufactured form; and specimens, maps, pictures, and instruments illustrative of various subjects studied or used by the Survey. Ralph W. Stone, geologist, was detailed to have charge of the exhibit and to give illustrated lectures daily describing the work of the Survey. The Survey has been awarded one grand prize, three medals of honor, three gold medals, two silver medals, and one bronze medal. Silver medals for collaboration were also awarded to the following Survey members: George H. Ashley, A. H. Brooks, J. C. Hoyt, S. J. Kübel, R. B. Marshall, and Edward W. Parker.

SCOPE OF THE WORK.

In the following pages of this administrative report the activities of each branch of the Survey are set forth in detail; the following paragraph is a brief summary of the whole. Geologic investigations were made in 47 States and Alaska; topographic surveys were made in 30 States, Alaska and Hawaii, and stream measurements were made in 41 States and Hawaii. The total area covered by the geologists in reconnaissance and detailed surveys was more than 76,000 square miles and the area topographically mapped by the topographers was more than 35,000 square miles. The land-classification work of the Geological Survey last year resulted in the classification of about 36,000 square miles in the public-land States. In the collection of statistics of mineral production the Geological Survey cooperated with the State geologists of 16 States and carried on correspondence with 90,000 producers.

WORK OF THE YEAR.

PUBLICATIONS.

The work of the Geological Survey is reflected chiefly in the publication and distribution of its printed reports and maps. The publications of the year consisted of 1 annual report, 1 monograph, 5 professional papers, 10 separate chapters from 2 professional papers, 35 bulletins, 30 separate chapters from 5 bulletins, 33 water-supply papers, 18 separate chapters from 4 water-supply papers, 1 annual report on mineral resources for 1913 (published also in 62 advance chapters, 15 delivered in 1913–14 and 47 in 1914–15), 5 advance chapters from the annual report on mineral resources for 1914, 3 geologic folios, 2 lists of publications, 1 list of topographic maps and folios, pamphlets entitled "Topographic instructions of the United States Geological Survey, 1915," and "Service bulletin, 1914," leaflets entitled "Nature and uses of topographic maps," "The production of copper in 1914," and "The production of spelter in 1914," 3 circulars concerning geologic folios, 22 index-map circulars, 55 press bulletins, and 10 monthly lists of new publications. The total number of pages in these publications was 23,574, a notable increase from the preceding year and a larger number than in any other year of the Survey's history. The publications of the year 1913–14 comprised 16,631 pages.

Brief notes on the publications of the year are given below.

THIRTY-FIFTH ANNUAL REPORT OF THE DIRECTOR of the United States Geological Survey to the Secretary of the Interior, for the fiscal year ended June 30, 1914. 1914. 163 pages, 2 plates.

A detailed account of the work of the Geological Survey during the fiscal year 1914, with a statement of the total appropriation made by Congress for the Survey

and the allotments for each kind of work. Under the heading "Special features" is a brief discussion of the province of a Federal Survey. The report also includes abstracts of the publications of the year and maps of the United States showing areas covered by topographic and geologic surveys.

MONOGRAPH 53. The Pleistocene of Indiana and Michigan and the history of the Great Lakes, by Frank Leverett and F. B. Taylor. 1915. 529 pages, 32 plates, 15 text figures. Price $1.50.

Describes in detail the glacial features and the great glacial lakes of a district which includes a considerable part of Indiana and all of the southern peninsula of Michigan. The question of a pre-Illinoian drift in southern Indiana is briefly treated, but the Wisconsin drift, the concealed portions of the earlier drift sheets that underlie it, and the somewhat intricate lake history associated with and following the retreat of the ice are the main subjects of discussion. The monograph is profusely illustrated with maps showing the topography and geology of the area discussed, glacial lakes and eskers, ancient lake beaches, morainic systems, profiles of warped water planes, and river distributaries. It is closely related to Monographs 38 and 41, which treat of glacial geology in districts directly adjoining that discussed in the present report.

PROFESSIONAL PAPER 85. Shorter contributions to general geology, 1913. David White, chief geologist. 1914. 99 pages, 14 plates, 7 text figures.

The first volume of a new series to be published annually by the Geological Survey under the title "Shorter contributions to general geology." In advance of the printing of the full volume, separates, each including one or more papers, are issued to the number of 10 or 12 a year as the manuscript and illustrations are ready without waiting until the material for the full volume is in hand or even promised. These separates are paged continuously, so that the volume is simply a consolidation of the separates, without change of pagination. The papers included in these "Shorter contributions to general geology" may relate to any phase of geology, provided it possesses general interest—petrology, paleontology, stratigraphy, glaciology, structural geology, etc. This volume is intended not as a catch-all for current odds and ends, but as a dignified collection of scientific contributions, each suitable in importance of subject, value of results, and quality of treatment for separate publication as a bulletin or professional paper if it were of sufficient length.

Professional Paper 85 contains the following contributions:

The origin of colemanite deposits, by H. S. Gale.

The mud lumps at the mouths of the Mississippi, by E. W. Shaw.

Interpretation of anomalies of gravity, by G. K. Gilbert.

The Jurassic flora of Cape Lisburne, Alaska, by F. H. Knowlton.

Resins in Paleozoic plants and in coals of high rank, by David White.

PROFESSIONAL PAPER 86. The transportation of débris by running water, by G. K. Gilbert, based on experiments made with the assistance of E. C. Murphy. 1914. 263 pages, 3 plates, 89 text figures.

The finer débris transported by a stream is borne in suspension; the coarser is swept along the channel bed. The suspended load is readily sampled and estimated, and much is known as to its quantity. The bed load is inaccessible, and we are without definite information as to its amount. The primary purpose of the investigation of which Professional Paper 86 is the outcome was to learn the laws which control the movement of the bed load, and especially to determine how the quantity of load is related to the stream's slope and discharge, and to the degree of comminution of the débris. The paper contains the record and discussion of a series of experiments made in a specially equipped laboratory at the University of California, Berkeley, in the years 1907–1909.

PROFESSIONAL PAPER 87. Geology and ore deposits of Copper Mountain and Kasaan Peninsula, Alaska, by C. W. Wright. 1915. 110 pages, 22 plates, 11 text figures.

A detailed description of the geology of Kasaan Peninsula and Copper Mountain, the two most important copper-bearing areas in southeastern Alaska, prefaced by a general account of the geology of the Ketchikan district, within which these areas lie. The mining development is only briefly discussed, because it is not of permanent interest and is fully treated in the Survey's annual bulletins showing the progress of investigations of mineral resources in Alaska. The genesis and occurrence of the copper ores are discussed, and special attention is paid to contact deposits, which are well exemplified in this region. The illustrations include a geologic map of the Ketchikan district, topographic and geologic maps of Copper Mountain and Kasaan Peninsula, plans and sections of mines, and halftone views of rocks and minerals from the areas discussed.

PROFESSIONAL PAPER 88. Lavas of Hawaii and their relations, by Whitman Cross. 1915. 97 pages, 4 plates.

Describes in detail the petrography of the Hawaiian Archipelago, treating each of the larger islands individually. It is an accepted generalization concerning the Hawaiian Islands that they have been built up by a long-continued series of volcanic eruptions beginning at a point far west of the principal islands of to-day. They represent, therefore, the higher summits of a chain of volcanic mountains, mainly submarine, rising from an ocean floor more than 20,000 feet below the surface of the sea and extending for about 1,800 miles in a general north-northwesterly direction. They appear to form a simple petrographic province whose igneous rocks are clearly consanguineous. The paper also discusses the mineral, chemical, and normative composition of the Hawaiian lavas, as well as their distribution and association, and the theoretical bearings of the data presented. A map of the islands, photomicrographs of the rocks, a diagram illustrating variation in normative composition of the lavas, and a table of normative ratios and symbols, accompany the report.

PROFESSIONAL PAPER 90. Shorter contributions to general geology, 1914. David White, chief geologist. 1915. 199 pages, 21 plates, 20 text figures.

A consolidation of 12 short papers which were first issued as parts A to L, inclusive, forming the second annual volume bearing this title. The corresponding volume for 1913 was Professional Paper 85.

Professional Paper 90 contains the following contributions:

Geology of the pitchblende ores of Colorado, by E. S. Bastin.

Erosion and sedimentation in Chesapeake Bay around the mouth of Choptank River, by J. F. Hunter.

Dike rocks of the Apishapa quadrangle, Colorado, by Whitman Cross.

The composition of crinoid skeletons, by F. W. Clarke and W. C. Wheeler.

Contributions to the stratigraphy of southwestern Colorado, by Whitman Cross and E. S. Larsen.

A reconnaissance in the Canyon Range, west-central Utah, by G. F. Loughlin.

The Montana group of northwestern Montana, by Eugene Stebinger.

A deep well at Charleston, S. C., by L. W. Stephenson, with a report on the mineralogy of the water by Chase Palmer.

The stratigraphy of the Montana group, with special reference to the position and age of the Judith River formation in north-central Montana, by C. F. Bowen.

The Cretaceous-Eocene contact in the Atlantic and Gulf Coastal Plain, by L. W. Stephenson.

The history of a portion of Yampa River, Colorado, and its possible bearing on that of Green River, by E. T. Hancock.

The inorganic constituents of echinoderms, by F. W. Clarke and W. C. Wheeler.

PROFESSIONAL PAPER 95–A. Composition of muds from Columbus Marsh, Nevada, by W. B. Hicks. 1915. pp. 1–11, fig. 1.

A part of Professional Paper 95, "Shorter contributions to general geology, 1915." Professional Paper 95–A is a further report on the investigation of the dry lake of Columbus Marsh, situated on or near the line between Esmeralda and Mineral counties, Nev. The investigation of this lake, begun in 1912, had for its economic motive the discovery of potash. Results of the work done in 1912 are given in Bulletin 540–N. Professional Paper 95–A tells of the work done in 1913, which included the drilling of one shallow well and the collection of a set of surface samples of muds from the marsh. After considering all the facts at hand, the author expresses his belief that large amounts of potash have been absorbed from surrounding or percolating solutions and are held in loosely combined form by the muds of Columbus Marsh and perhaps by the muds of the desert basins in general, while the other salts, being less completely absorbed, have been gradually concentrated through evaporation. This theory explains the presence of the natural brines and salt incrustations with low potash content now found in the desert regions of the United States.

PROFESSIONAL PAPER 95–B. Eocene glacial deposits in southwestern Colorado, by W. W. Atwood. 1915. pp. 13–26, Pls. I–IV, figs. 2–11.

Professional Paper 95–B describes briefly the geology of the Montrose quadrangle, near Ridgway, Colo., at the base of the San Juan Mountains. This locality is of especial interest because one series of its exposed rocks includes a section of glacial till that is overlain by formations of Tertiary age. These exposures were found in September, 1913, in the same region where three distinct stages of Pleistocene glaciation among the mountains were demonstrated in 1912. The illustrations include a map of the area discussed, showing distribution of Eocene and Pleistocene glacial deposits, and geologic sections at several localities near Ridgway, Colo.

BULLETIN 541. Contributions to economic geology (short papers and preliminary reports), 1912, Part II, Mineral fuels—M. R. Campbell, geologist in charge. 1914. 532 pages, 29 plates, 17 text figures.

This bulletin includes 26 brief reports of two classes—(1) short papers giving comparatively detailed descriptions of occurrences that have economic interest but are not of sufficient importance to warrant a more extended description; (2) preliminary reports on economic investigations, the results of which are to be published later in more detailed form. These papers are such only as have a direct economic bearing, all topics of purely scientific interest being excluded. They have been grouped according to subjects or general regions, and each group has been issued as an advance chapter as soon as it was ready. A complete list of the papers included in the volume follows:

Oil and gas in the northern part of the Cadiz quadrangle, Ohio, by D. D. Condit.

Gas from mud lumps at the mouths of the Mississippi, by E. W. Shaw.

Structure of the Fort Smith-Poteau gas field, Arkansas-Oklahoma, by C. D. Smith.

The Glenn oil and gas pool and vicinity, Oklahoma, by C. D. Smith.

The Douglas oil and gas field, Converse County, Wyo., by V. H. Barnett.

The Shoshone River section, Wyoming, by D. F. Hewett.

Oil and gas near Green River, Grand County, Utah, by C. T. Lupton.

Petroleum near Dayton, N. Mex., by G. B. Richardson.

Reconnaissance of the Barstow-Kramer region, California, by R. W. Pack.

Rhode Island anthracite, by G. H. Ashley.

Coking coal in Powell Mountain, Scott County, Va., by M. R. Campbell.

The coal resources and general geology of the Pound quadrangle of Virginia and Kentucky, by Charles Butts.

The coal resources of a part of northeastern Missouri, by F. C. Greene.

The Cannonball River lignite field, Morton, Adams, and Hettinger counties, N. Dak., by E. R. Lloyd.

Lignite in the vicinity of Plentywood and Scobey, Sheridan County, Mont., by C. M. Bauer.

Geology and coal resources of the area southwest of Custer, Yellowstone, and Bighorn counties, Mont., by G. S. Rogers.

Coal discovered in a reconnaissance survey between Musselshell and Judith, Mont., by C. F. Bowen.

The Cleveland coal field, Blaine County, Mont., by C. F. Bowen.

The Big Sandy coal field, Chouteau County, Mont., by C. F. Bowen.

The Horseshoe Creek district of the Teton Basin coal field, Fremont County, Idaho, by E. G. Woodruff.

The Glacier coal field, Whatcom County, Wash., by E. G. Woodruff.

The Eden Ridge coal field, Coos County, Oreg., by C. E. Lesher.

Geology and coal resources of the Sierra Blanca coal field, Lincoln and Otero counties, N. Mex., by C. H. Wegemann.

Coal near Thompson, Grand County, Utah, by F. R. Clark.

Coal near Wales, Sanpete County, Utah, by F. R. Clark.

Analyses of coal samples from various fields in the United States, by M. R. Campbell.

BULLETIN 544. Fauna of the Wewoka formation of Oklahoma, by G. H. Girty. 1915. 353 pages, 35 plates.

Describes the fauna of the Wewoka formation, which is typically exposed in the Coalgate and Wewoka quadrangles, in Atoka, Coal, Hughes, Okfuskee, Okmulgee, Pittsburg, Pontotoc, and Seminole counties, Okla. This formation occupies a part of the Carboniferous area of Oklahoma, which is especially interesting because its rocks were laid down under physical conditions so much at variance with those of the Carboniferous areas farther north and east that both its sediments and its faunas show marked differences from those of the other areas. The fossils of the Wewoka formation are in an excellent state of preservation and offer an opportunity for careful generic and specific studies which may serve as a starting point for work in less satisfactory material. The illustrations show specimens of the fossils described in the report.

BULLETIN 548. Electric activity in ore deposits, by R. C. Wells. 1914. 78 pages, 7 text figures.

A contribution to the study of ore deposits, showing that contact with solutions, as well as some other conditions, may impart electric energy to certain metalliferous minerals, thus transforming them into conductors of electric currents in ore deposits. Under certain conditions the valuable metals may be deposited from solutions by electrolytic action and thereafter be protected from redissolving by contact with any of the more oxidizable ores. Although the results thus far obtained afford no adequate basis for any method of electric prospecting, this bulletin possesses value in the broader investigation of ores, for even feeble currents may exert a directional influence on ore deposition, and chemical conditions, even at a distance, may be a factor in determining mineral association. The illustrations consist of diagrams showing apparatus and methods used in studying currents produced by combinations of solutions and minerals.

BULLETIN 549. The Shinumo quadrangle, Grand Canyon district, Arizona, by L. F. Noble. 1914. 100 pages, 18 plates, 1 text figure.

Ever since Powell's daring boat trip down the Colorado in 1869 geologists have known that the walls of the Grand Canyon display one of the most remarkable and instructive geologic sections in the world. Bulletin 549 treats of the geology of part of this district—the Shinumo quadrangle, covering about 270

square miles in Coconino County, northern Arizona. Although the book contains considerable lithologic and stratigraphic material that will scarcely interest those who are not geologists, the author has very properly remembered that the people as a whole have unusual claims to consideration in any publication dealing with the Grand Canyon, and has skillfully supplied as a setting to his more strictly scientific work much vivid description and lucid explanation, which will help all those who take more than a transient and superficial interest in what they see to understand one of the most impressive and significant of the inanimate works of nature.

The map which accompanies this bulletin represents the first geologic mapping done in the canyon that attains the standard of accuracy and detail set for the Geologic Atlas of the United States.

BULLETIN 550. The ore deposits of northeastern Washington, by Howland Bancroft including a section on the Republic mining district by Waldemar Lindgren and Howland Bancroft. 1914. 215 pages, 19 plates, 26 text figures.

Describes the geology of an area of about 6,000 square miles in Stevens and Ferry counties, northeastern Washington, giving detailed information as to its mining districts and ore deposits—chiefly lead, zinc, and copper. States that the general conditions for mining are particularly favorable and discusses briefly the methods and costs of mining, treatment of the ores, and means of transportation. The illustrations include plans and sketch maps of some of the mines and halftone plates showing geologic conditions.

BULLETIN 559. Results of spirit leveling in Michigan, 1911 and 1913—R. B. Marshall, chief geographer. 1914. 79 pages, 1 plate.

BULLETIN 560. Results of spirit leveling in Minnesota, 1897 to 1914, inclusive, R. B. Marshall, chief geographer. 1915. 190 pages, 1 plate.

BULLETIN 561. Results of spirit leveling in Hawaii, 1910 to 1913, inclusive. R. B. Marshall, chief geographer. 1914. 42 pages, 1 plate.

BULLETIN 562. Results of spirit leveling in Virginia, 1900 to 1913, inclusive. R. B. Marshall, chief geographer. 1914. 68 pages, 1 plate.

BULLETIN 563. Results of spirit leveling in Maryland, 1896 to 1911, inclusive. R. B. Marshall, chief geographer. 1914. 80 pages, 1 plate.

BULLETIN 566. Results of spirit leveling in Utah, 1897 to 1914, inclusive. R. B. Marshall, chief geographer. 1915. 77 pages, 1 plate.

BULLETIN 567. Results of spirit leveling in Idaho, 1896 to 1914, inclusive. R. B. Marshall, chief geographer. 1915. 130 pages, 1 plate.

BULLETIN 569. Results of spirit leveling in Iowa, 1896 to 1913, inclusive. R. B. Marshall, chief geographer. 1915. 126 pages, 1 plate.

BULLETIN 570. Results of spirit leveling in Wisconsin, 1897 to 1914, inclusive. R. B. Marshall, chief geographer. 1914. 86 pages, 1 plate.

BULLETIN 572. Results of spirit leveling in Nebraska, 1896 to 1913, inclusive. R. B. Marshall, chief geographer. 1914. 57 pages, 1 plate.

Reports on precise and primary leveling in the States mentioned, showing the exact altitude of a great number of places. The work in Michigan, Hawaii, and Maryland, and part of that in Minnesota, Virginia, Iowa, and Nebraska was done in cooperation with the States. Each bulletin contains a halftone plate showing Geological Survey designs for bench marks.

BULLETIN 574. Mining districts of the Dillon quadrangle, Montana, and adjacent areas, by A. N. Winchell. 1914. 191 pages, 8 plates, 16 text figures.

A sketch of the geology of the Dillon quadrangle, which covers about 3,200 square miles in southwestern Montana, and detailed descriptions of its mining districts. The illustrations consist of geologic sketch maps of many of the districts and halftone plates showing geologic conditions.

BULLETIN 576. Geology of the Hanagita-Bremner region, Alaska, by F. H. Moffit. 1914. 56 pages, 6 plates, 6 text figures.

This bulletin presents information about a region that was very little known prior to 1911. Although the author's survey was of a reconnaissance character it was sufficiently detailed to outline the geography, general geology, and geologic history of the region and to obtain information about the occurrence and distribution of the gold and copper deposits. The Hanagita-Bremner region includes some mineral deposits which, though almost undeveloped, give promise of becoming commercially valuable, now that they have been made comparatively accessible by the railroad recently completed up the Copper River valley. The illustrations include topographic and geologic reconnaissance maps, a map showing the distribution of timber, and diagrams illustrating some of the methods of formation of canyons and other stream channels.

BULLETIN 577. Geology of the phosphate deposits northeast of Georgetown, Idaho, by R. W. Richards and G. R. Mansfield. 1914. 76 pages, 14 plates, 3 text figures.

This report discusses briefly the geography and geology of an area in Bear Lake and Bannock counties, southeastern Idaho, and a part of Georgetown Canyon. Detailed descriptions, by townships, of the phosphate deposits are given, and the book contains geologic maps and sections of many of the phosphate-bearing districts. The type of geologic survey represented in this work is a development of the constantly increasing requirement for detail. The delineation of phosphate outcrops in areas beyond the properties that have been located and the estimation of the depth, tonnage, and quality of the different beds furnish part of the data.

BULLETIN 578. The Iditarod-Ruby region, Alaska, by H. M. Eakin. 1914. 45 pages, 6 plates, 1 text figure.

Describes an area in west-central Alaska between the mining settlements on Iditarod River and those on the Yukon at Ruby, visited by the author in the summer of 1913. This volume is the third report based on work inspired by the discovery of gold in the Innoko district in 1906. The author shows that the bedrock sources of the placer gold in this district include the igneous intrusive rocks and the Cretaceous sediments at or near their contacts with the intrusives; also that the auriferous lodes thus far found are closely associated with dikes and other intrusive rocks. These conditions augur well for the future of the mining industry of the region, for similar conditions exist in other parts of Alaska where gold mining is successfully carried on.

BULLETIN 579. Reconnaissance of oil and gas fields in Wayne and McCreary counties, Ky., by M. J. Munn. 1914. 105 pages, 6 plates, 6 text figures.

Gives a brief description of the stratigraphy and structure of the rocks in Wayne and McCreary counties, Ky., with especial reference to their oil and gas content. The oil and gas fields are treated in detail, and numerous records of wells are given. As to the future of the area, there is every reason to suppose that many other profitable oil pools will be found eventually in districts in and adjacent to Wayne County, and the structural conditions seem to favor the practical application of geology in finding these pools. The illustrations include sketch maps showing the location of oil and gas pools, sections of deep wells, and views of specimens from the Beaver Creek oil "sand."

BULLETIN 580. Contributions to economic geology (short papers and preliminary reports), 1913, Part I, Metals and nonmetals except fuels. F. L. Ransome and H. S. Gale, geologists in charge. 1915. 462 pages, 9 plates, 97 text figures.

This bulletin is made up of 16 brief reports on investigations of mineral deposits except fuels in the United States in 1913. The papers included are of the two classes indicated for Bulletin 541 (p. 19). A list of the papers, arranged according to subjects, is given below:

Gold and silver.

Gold placers on Wind and Bighorn rivers, Wyoming, by F. C. Schrader.
Lode deposits of the Alleghany district, California, by H. G. Ferguson.
The Rochester mining district, Nevada, by F. C. Schrader.

Copper.

Notes on the Unaweep copper district, Colorado, by B. S. Butler.
The Grand Gulch mining region, Mohave County, Ariz., by J. M. Hill.

Lead and zinc.

The Darwin silver-lead mining district, California, by Adolph Knopf.
Some cerusite deposits in Custer County, Colo., by J. F. Hunter.
Ore deposits in the Sawtooth quadrangle, Blaine and Custer counties, Idaho, by J. B. Umpleby.

Rare metals.

Carnotite near Mauch Chunk, Pa., by E. T. Wherry.
The rutile deposits of the eastern United States, by T. L. Watson.

Phosphates.

The phosphate deposits of South Carolina, by G. S. Rogers.
The Elliston phosphate field, Montana, by R. W. Stone and C. A. Bonine.

Salines.

Salines in the Owens, Searles, and Panamint basins, southeastern California, by H. S. Gale.

Miscellaneous.

A new gypsum deposit in Iowa, by G. F. Kay.
Some deposits of mica in the United States, by D. B. Sterrett.
Publications by Survey authors on metals and nonmetals except fuels, compiled by I. P. Evans.

BULLETIN 581. Contributions to economic geology (short papers and preliminary reports), 1913, Part II, Mineral fuels. M. R. Campbell and David White, geologists in charge. 1915. 187 pages, 11 plates, 6 text figures.

This bulletin includes six brief reports of the two classes indicated for Bulletin 541 (p. 19). A list of the papers follows:

Petroleum and natural gas.

Oil shale of northwestern Colorado and northeastern Utah, by E. G. Woodruff and D. T. Day.
Oil and gas in the western part of the Olympic Peninsula, Wash., by C. T. Lupton.
The Moorcroft oil field, Crook County, Wyo., by V. H. Barnett.
Possibilities of oil in the Big Muddy dome, Converse and Natrona counties, Wyo., by V. H. Barnett.
Geology and oil prospects in Waltham, Priest, Bitterwater, and Peachtree valleys, Cal., by R. W. Pack and W. A. English.

Coal.

The Coalville coal field, Utah, by C. H. Wegemann.

BULLETIN 582. Mineral deposits of the Santa Rita and Patagonia mountains, Arizona, by F. C. Schrader, with contributions by J. M. Hill. 1915. 373 pages, 25 plates, 46 text figures.

The purpose of this paper is to furnish a general idea of the character, occurrence, distribution, and development of the mineral resources of a desert area comprising about 1,400 square miles in Pima and Santa Cruz counties, Ariz., 26 miles southeast of Tucson. The physiography, geology, and water supply of the area are briefly discussed, and the mining districts, camps, and properties are considered in detail. The deposits include gold, silver, copper, lead, zinc, tungsten, molybdenum, and building materials. Topographic and geologic maps of the area discussed and of parts of it, maps, plans, and sections of some of the mines and their workings, and halftone plates showing geologic features make up the illustrations.

BULLETIN 583. Colorado ferberite and the wolframite series, by F. L. Hess and W. T. Schaller. 1914. 75 pages, 14 plates, 35 text figures.

This report is made up of two papers, namely, "The mineral relations of ferberite," by Mr. Hess, and "Crystallography of ferberite from Boulder County, Colo.," by Mr. Schaller. Ferberite, as ordinarily defined, is that mineral of the wolframite series which is composed wholly or almost wholly of iron tungstate and which, like other wolframites, crystallizes in the monoclinic system. It is comparatively rare and where found seems to occur in small quantities only. It occurs in largest quantity in the locality described in this report. The illustrations of Bulletin 583 include diagrams and halftone plates representing crystals of ferberite.

BULLETIN 584. Bibliography of North American geology for 1913, with subject index, by J. M. Nickles. 1914. 183 pages.

A list, arranged alphabetically by authors' names, of publications on the geology of the continent of North America and adjacent islands, also Panama and the Hawaiian Islands, issued in 1913. The work is indexed and contains lists of chemical analyses reported and minerals, rocks, and formations described.

BULLETIN 586. Slate in the United States, by T. N. Dale and others. 1914. 220 pages, 26 plates, 18 text figures.

This volume is not only a corrected and revised edition of Bulletin 275, "Slate deposits and slate industry of the United States," but also contains the results of all recent discoveries and studies of slate in this country. Its plan is (1) to set forth, in succinct form, the present state of scientific knowledge as to the origin, structure, texture, and chemical and mineral composition of slate; (2) to describe in more or less detail the slates and quarries of each district; and (3) to consider the economic geology of slate, including scientific prospecting for it, methods of testing it, slate machinery, and the uses of slate and slate waste, together with a tabular summary of the slates described. The book is illustrated by numerous maps showing the location of slate deposits and quarry sites in New England, the Middle Atlantic States, and Arkansas, and halftone plates showing some of the quarries.

BULLETIN 588. The constitution of the natural silicates, by F. W. Clarke. 1914. 123 pages.

This bulletin represents the results of a study of the chemical structure of the silicates found in the solid crust of the earth. From the geologist's point of view the silicates are of fundamental importance, for they form at least nine-tenths of the entire known mass of the earth's crust, and a study of their inner constitution may be reasonably expected to shed light upon many serious problems. Every primitive rock or eruptive mass contains an aggregation of silicates, each one capable of undergoing chemical change by which alteration products are formed, so that in time the rock may become transformed into new substances, quite unlike those which originally existed in it. A knowledge of the processes which thus occur, dependent on chemical structure, should be

applicable to the study of the rocks and should ultimately render it possible so to investigate a metamorphosed mass as to clearly indicate its origin.

BULLETIN 589. The calcite marble and dolomite of eastern Vermont, by T. N. Dale. 1914. 67 pages, 2 plates, 11 text figures.

A companion report to Bulletin 521, "The commercial marbles of western Vermont," by the same author. The region discussed in the earlier report includes the most extensive marble industry in the United States, whereas Bulletin 589 relates to a virgin field whose development is still a work of the future. The object of this bulletin is twofold—to locate definitely and describe accurately the marbles and dolomites of eastern Vermont with a view to setting forth their possible economic uses and to discuss whatever features of scientific interest they may present. To this end the deposits are treated in detail by counties and towns. The illustrations include a map of the State and maps of many of the townships, showing the marble and dolomite localities described.

BULLETIN 590. Reconnaissance of the geology and oil prospects of northwestern Oregon, by C. W. Washburne. 1914. 111 pages, 1 plate.

This report is based on a hasty reconnaissance, made during the summer of 1910, of a certain part of the Coast Range of Oregon, where the presence of oil had been suggested by the topographic similarity of the locality to the oil regions of California. It contains a brief description of the geology of the district as a whole and of each county, as well as discussions of the oil and gas indications in each county. The author concludes that there is no good reason for believing that oil will be found in the northern part of the Coast Range of Oregon. A map of northwestern Oregon showing gas and oil prospects accompanies the report.

BULLETIN 592. Mineral resources of Alaska—report on progress of investigations in 1913, by A. H. Brooks and others. 1914. 413+xi pages, 17 plates, 13 text figures.

A collection of 21 papers by 13 authors on the work of the Geological Survey in Alaska during 1913. Papers of a general character are presented first, followed by those treating of special districts, arranged geographically from south to north. The book contains preliminary statements on investigations made during the year and summaries of the conditions of the mining industry, including statistics of mineral production. It is illustrated by maps showing the distribution of mineral resources in the whole Territory and in certain portions of it and by sketch maps showing the location of lode prospects in some of the districts. The titles of the papers are given below:

Administrative report, by A. H. Brooks.

The mineral deposits of Alaska, by A. H. Brooks.

The Alaskan mining industry in 1913, by A. H. Brooks.

Lode mining in the Ketchikan region, by P. S. Smith.

Marble resources of the Juneau, Skagway, and Sitka districts, by E. F. Burchard.

A barite deposit near Wrangell, by E. F. Burchard.

Mineral deposits of the Yakataga district, by A. G. Maddren.

Preliminary report on a water-power reconnaissance in south-central Alaska, by C. E. Ellsworth and R. W. Davenport.

The Port Wells gold-lode district, by B. L. Johnson.

Mining on Prince William Sound, by B. L. Johnson.

Gold lodes and placers of the Willow Creek district, by S. R. Capps.

Mineral resources of the upper Matanuska and Nelchina valleys, by G. C. Martin and J. B. Mertie, jr.

Preliminary report on the Broad Pass region, by F. H. Moffit.

Mining in the Valdez placer district, by F. H. Moffit.

The Chisana placer district, by A. H. Brooks.

Lode mining near Fairbanks, by Theodore Chapin.
Placer mining in the Yukon-Tanana region, by Theodore Chapin.
Placer mining in the Ruby district, by H. M. Eakin.
Mineral resources of the Yukon-Koyukuk region, by H. M. Eakin.
Placer mining on Seward Peninsula, by Theodore Chapin.
Lode developments on Seward Peninsula, by Theodore Chapin.

BULLETIN 594. Some mining districts in northeastern California and northwestern Nevada, by J. M. Hill. 1915. 200 pages, 19 plates, 4 text figures.

A general outline of the geology of a part of northern California and northwestern Nevada, with a brief statement of the nature and occurrence of the ore deposits as a whole and detailed descriptions of individual mining districts. In these descriptions the following points concerning the districts are considered: Location, accessibility, history, production, climate and vegetation, topography, geology, type and origin of the ore deposits, and origin and character of the veins. Sketch maps of the districts, structure sections of the mountain ranges, and halftone plates showing geologic features make up the illustrations.

BULLETIN 596. Geology and coal resources of North Park, Colo., by A. L. Beekly. 1915. 121 pages, 12 plates, 1 text figure.

Describes the geography, stratigraphy, structure, and economic geology of North Park, a great natural depression in the Rocky Mountains of northern Colorado, sharply defined as a topographic unit by its prominent, almost continuous rim of mountain crests 2,000 to 5,000 feet above the bottom of the basin. On account of its remoteness from frequented routes of travel, very little has been known of the geology of this basin until recent years. As coal is the most valuable known mineral resource of North Park, this report calls special attention to the coal deposits, discussing their occurrence and development and the production and estimated tonnage of the mines. The illustrations consist of a geologic map and sections of North Park, sections of coal beds, and photographic views of geologic features.

BULLETIN 599. Our mineral reserves—how to make America industrially independent, by G. O. Smith. 1914. 48 pages.

The readjustments in the world's commerce necessitated by the European war have already imposed new conditions on the mineral industry as well as on other industries. Second only in importance to the food supply is the supply of mineral products necessary to meet the requirements of twentieth-century civilization. The United States has cause for congratulation in the facts that it is almost independent in the possession of essential mineral resources and that the interference with manufacturing caused by interruption of the importation of many necessary raw materials may be overcome almost wholly by development of neglected resources in our own country. Beginning in August, 1914, there was a lively demand for information regarding possible sources of mineral products, both crude and manufactured. Bulletin 599 was issued for the purpose of furnishing to the public in convenient form a summary of the mineral resources available for utilization under the pressure of present conditions, in the hope of encouraging their development and discouraging the importation of raw material and products which can be supplied at home.

BULLETIN 600. The Glacier National Park: a popular guide to its geology and scenery, by M. R. Campbell. 1914. 54 pages, 13 plates, 13 text figures.

Describes briefly the geology and scenery of the Glacier National Park, which was set apart by act of Congress in 1910 and includes that part of the Front Range of the Rocky Mountains lying just south of the Canadian line in Teton and Flathead counties, Mont. Illustrated by a topographic map of the park, diagrams showing geologic features, and halftone plates depicting some of the wonderful scenery to be found and enjoyed there.

BULLETIN 612. Guidebook of the western United States, Part B, The Overland Route, with a side trip to Yellowstone Park, by W. T. Lee, R. W. Stone, H. S. Gale, and others. 1915. 244 pages, 29 route maps, 50 plates, 20 text figures.

A handbook for the traveler which deals not only with the geology but with the natural resources, history, and development of the country between Omaha and San Francisco. It shows how differences in scenery and climate depend upon past geologic events and dispels the monotony of the Great Plains by taking the traveler back to times when these regions supported a vegetation very different from their present scanty covering and were inhabited by animals of strange forms and huge size. The scenery of the mountains acquires additional interest from the explanation of the earth movements and the resulting rock structure to which fundamentally the mountain forms are due. Even the desert becomes attractive when the traveler is told of its vanished lakes and is shown the old beach lines which their waves cut in the now arid hillsides.

The book is intended to educate by being interesting, to win hearing for the story of geology by telling it in a clear and simple way, with abundant illustration from the car windows not only of the story itself but of its intimate connection with human life.

The text deals with the route consecutively from east to west and is accompanied by a series of conveniently folded maps and by abundant halftone cuts and diagrams. Matter slightly more technical or detailed than is comprised in the body of the text, although not necessarily less interesting on that account, has been printed as footnotes.

BULLETIN 620–A. A gold-platinum-palladium lode in southern Nevada, by Adolph Knopf. 1915. pp. 1–18, Pl. I, fig. 1.

Part of Bulletin 620, "Contributions to economic geology, 1915, Part I." A brief description of the geology of the district surrounding the Boss copper mine, in the Yellow Pine mining district, Clark County, Nev., at which platinum-bearing gold ore was discovered in 1914. The development of the mine and the genesis of the ore are discussed and a review is given of the known lode occurrences of platinum. Great interest attaches to so unusual and remarkable an occurrence of platinum and palladium in a gold-bearing lode. The Boss vein is one of the few primary deposits in which metals of the platinum group occur in more than traces and, with one possible exception (the New Rambler mine in Wyoming), is the only primary deposit of economic importance in which these metals are the constituents of predominant value.

WATER-SUPPLY PAPER 312. Surface water supply of the United States, 1911, Part XII, North Pacific coast drainage basins, prepared under the direction of M. O. Leighton by F. F. Henshaw, G. C. Baldwin, G. C. Stevens, and E. S. Fuller. 1915. 706 pages, 4 plates.

Presents briefly the results of measurements of flow made on streams of the north Pacific coast of the United States during the calendar year 1911. Data for each gaging station are given under the following headings: Location, Records available, Drainage area, Gage, Channel, Discharge measurements, Accuracy, and Cooperation. The book also contains tables giving gage heights and daily and monthly discharges at each station, lithographed maps showing the mean annual precipitation and run-off in the United States, and halftone plates representing typical gaging stations and current meters.

WATER-SUPPLY PAPER 321. Surface water supply of the United States, 1912, Part I, North Atlantic coast basins, by C. C. Babb, C. C. Covert, and J. G. Mathers. 1914. 240 pages, 3 plates.

WATER-SUPPLY PAPER 325. Surface water supply of the United States, 1912, Part V, Upper Mississippi River and Hudson Bay basins, by A. H. Horton, W. G. Hoyt, and H. J. Jackson. 1914. 193 pages, 2 plates.

WATER-SUPPLY PAPER 326. Surface water supply of the United States, 1912, Part VI, Missouri River basin, by W. A. Lamb, Robert Follansbee, and H. D. Padgett. 1914. 375 pages, 2 plates.

WATER-SUPPLY PAPER 327. Surface water supply of the United States, 1912, Part VII, Lower Mississippi River basin, by Robert Follansbee. 1914. 84 pages, 2 plates.

WATER-SUPPLY PAPER 328. Surface water supply of the United States, 1912, Part VIII, Western Gulf of Mexico basins, by W. W. Follett, Robert Follansbee, and G. A. Gray. 1914. 121 pages, 2 plates.

WATER-SUPPLY PAPER 329. Surface water supply of the United States, 1912, Part IX, Colorado River basin, by Robert Follansbee, E. A. Porter, and H. D. Padgett. 1914. 238 pages, 2 plates.

WATER-SUPPLY PAPER 330. Surface water supply of the United States, 1912, Part X, The Great Basin, by F. F. Henshaw, E. A. Porter, and G. C. Stevens. 1914. 275 pages, 3 plates.

WATER-SUPPLY PAPER 331. Surface water supply of the United States, 1912, Part XI, Pacific coast basins in California, by H. D. McGlashan and G. C. Stevens. 1914. 442 pages, 2 plates.

WATER-SUPPLY PAPER 332–A. Surface water supply of the Pacific drainage basins in Washington and upper Columbia River basin, 1912, by F. F. Henshaw and W. A. Lamb. 1915. 282 pages, 2 plates.

WATER-SUPPLY PAPER 332–C. Surface water supply of lower Columbia River and Rogue, Umpqua, and Siletz rivers, 1912, by F. F. Henshaw and E. S. Fuller. 1914. 226 pages.

These reports present briefly the results of measurements of stream flow made in the drainage basins named during the calendar year 1912. Data for each gaging station are given under the following headings: Location, Records available, Drainage area, Gage, Channel, Discharge measurements, Artificial control, Winter flow, Accuracy, and Cooperation. The books also contain tables giving gage heights and daily and monthly discharges at each station, and halftone plates representing typical gaging stations and current meters.

WATER-SUPPLY PAPER 335. Geology and underground waters of the southeastern part of the Texas Coastal Plain, by Alexander Deussen. 1914. 365 pages, 6 plates, 17 text figures.

The area discussed in this report embraces 36,317 square miles and includes that part of the Coastal Plain of Texas lying east of Brazos River and south of a line extending east and west through Jefferson, in Marion County. The paper includes a brief description of the geology of this area, with special reference to the underground-water horizons, and discussions of the quality of the water and artesian conditions and prospects in each of the several counties, as well as a geologic map of a part of eastern Texas, maps of several of the artesian reservoirs, maps showing the distribution of timber and the mean annual rainfall and run-off, and diagrams and sections showing ground-water conditions.

WATER-SUPPLY PAPER 336. Water resources of Hawaii, 1912, by C. H. Pierce and G. K. Larrison. 1914. 392 pages.

This volume contains results of measurements of the flow of certain streams and ditches in the Territory of Hawaii made during the calendar year 1912.

WATER-SUPPLY PAPER 338. Springs of California, by G. A. Waring. 1915. 410 pages, 13 plates, 4 text figures.

As a basis for the discussion of springs and spring waters of California this paper opens with a brief outline of the physical features of the State, together with a few notes on the character of the rocks and their structure, then proceeds to explain the usual or possible composition and properties of most natural waters as well as the source of their constituent substances, and concludes with dis-

cussions of the springs of California classified under the following groups: Hot, carbonated, sulphur, saline, magnesic, iron, artesian, large cold, and minor perennial springs. Accompanying the discussions of many of the springs are analyses of their waters, and at the end of the book are two tables, one of which gives an alphabetic list, by counties, of the best-known springs of the State, with name of owner, location, temperature, and yield, and the other a list of California spring resorts. The illustrations consist of lithologic and topographic maps of the State, showing locations of springs, and photographs of many of the springs and their environs.

WATER-SUPPLY PAPER 339. Quality of the surface waters of Washington, by Walton Van Winkle. 1914. 105 pages, 2 plates, 1 text figure.

A brief discussion of the constituents, uses, and purification of natural waters and a detailed consideration, by drainage basins, of the quality of the stream waters of Washington, showing the nature and amount of the material they hold in solution. The book contains many analyses.

WATER-SUPPLY PAPER 340–C. Stream-gaging stations and publications relating to water resources, 1885–1913, Part III, Ohio River basin, compiled by B. D. Wood. 1914. pp. i–xxii, 31–42.

WATER-SUPPLY PAPER 340–D. Stream-gaging stations and publications relating to water resources, 1885–1913, Part IV, St. Lawrence River basin, compiled by B. D. Wood. 1914. pp. i–xx, 43–52.

WATER-SUPPLY PAPER 340–E. Stream-gaging stations and publications relating to water resources, 1885–1913, Part V, Hudson Bay and upper Mississippi River drainage basins, compiled by B. D. Wood. 1914. pp. i–xxi, 53–61.

WATER-SUPPLY PAPER 340–F. Stream-gaging stations and publications relating to water resources, 1885–1913, Part VI, Missouri River basin, compiled by B. D. Wood. 1915. pp. i–xxiii, 63–81.

WATER-SUPPLY PAPER 340–G. Stream-gaging stations and publications relating to water resources, 1885–1913, Part VII, Lower Mississippi River basin, compiled by B. D. Wood. 1915. pp. i–xxi, 83–93.

WATER-SUPPLY PAPER 340–H. Stream-gaging stations and publications relating to water resources, 1885–1913, Part VIII, Western Gulf of Mexico drainage basins, compiled by B. D. Wood. 1915. pp. i–xx, 95–104.

WATER-SUPPLY PAPER 340–I. Stream-gaging stations and publications relating to water resources, 1885–1913, Part IX, Colorado River basin, compiled by B. D. Wood. 1915. pp. i–xxiii, 105–116.

WATER-SUPPLY PAPER 340–J. Stream-gaging stations and publications relating to water resources, 1885–1913, Part X, The Great Basin, compiled by B. D. Wood. 1915. pp. i–xxi, 117–129.

WATER-SUPPLY PAPER 340–K. Stream-gaging stations and publications relating to water resources, 1885–1913, Part XI, Pacific coast basins in California, compiled by B. D. Wood. 1915. pp. i–xxiv, 131–146.

Parts of Water-Supply Paper 340, a directory of Survey stream-gaging stations and publications relating to water resources of the United States. Each part contains a list of all gaging stations maintained in the section named in its title and an annotated list of publications issued by the United States Geological Survey relating specifically to that section, as well as a similar list of reports that are of general interest, covering a wide range of hydrologic subjects, and brief references to reports published by State and other organizations.

Water-Supply Paper 340–C pertains to the Ohio River basin, which includes Ohio River with all its tributaries, the most important being Allegheny, Monongahela, Beaver, Muskingum, New (or Kanawha), Scioto, Miami, Kentucky, Wabash, Cumberland, and Tennessee rivers. These streams drain wholly or in part the

States of Alabama, Georgia, Illinois, Indiana, Kentucky, Mississippi, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia.

Water-Supply Paper 340–D pertains to the United States portion of the St. Lawrence River basin, which includes streams that drain into the Great Lakes and St. Lawrence River from the United States. These streams drain wholly or in part the States of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Vermont, and Wisconsin.

Water-Supply Paper 340–E pertains to the United States portion of the Hudson Bay and upper Mississippi River basins, which include streams (from the United States) whose waters reach Hudson Bay and the Mississippi above its junction with the Ohio (except the Missouri). These streams drain wholly or in part the States of Illinois, Indiana, Iowa, Minnesota, Missouri, Montana, North Dakota, South Dakota, and Wisconsin.

Water-Supply Paper 340–F pertains to the Missouri River basin, which includes Missouri River and all its tributaries, the most important being Jefferson, Madison, Gallatin, Prickly Pear, Little Prickly Pear, Dearborn, Sun, Marias, Judith, Musselshell, Milk, Yellowstone, Little Muddy, Little Missouri, Cheyenne, Niobrara, Platte (including North Platte and South Platte), Kansas, Osage, and Gasconade rivers. These streams drain wholly or in part the States of Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, and Wyoming.

Water-Supply Paper 340–G pertains to the lower Mississippi River basin, which includes the main stream and all its tributaries below the mouth of the Ohio, the most important tributaries being Meramec, White, Arkansas, Yazoo, Homochitto, and Red rivers. These streams drain wholly or in part the States of Arkansas, Colorado, Kansas, Kentucky, Louisiana, Mississippi, Missouri, New Mexico, Oklahoma, Tennessee, and Texas.

Water-Supply Paper 340–H pertains to the western Gulf of Mexico basins, which include all streams draining into the Gulf of Mexico west of the mouth of the Mississippi and into the Rio Grande. The largest of these streams are the Rio Grande, Sabine, Trinity, and Brazos rivers, Colorado River of Texas, Guadalupe and Chama rivers, Rio Puerco and Pecos River, in the United States, and Rio Salado and Rio San Juan in Mexico, draining wholly or in part the States of Colorado, Louisiana, New Mexico, Texas, and the northern States of Mexico.

Water-Supply Paper 340–I pertains to the Colorado River basin, which includes Green, Grand, Dolores, San Juan, Little Colorado, Virgin, and Gila rivers. These streams drain wholly or in part the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming.

Water-Supply Paper 340–J pertains to the Great Basin, which is made up of a number of minor basins whose streams do not discharge into the ocean. The largest of these minor basins are the depressions that hold Great Salt Lake, Sevier Lake, Humboldt Sink, Truckee, Walker, Carson, and Owens rivers, and Honey, Mono, Malheur, Harney, Warner, Abert, Summer, and Silver lakes. The streams of this section drain wholly or in part the States of California, Idaho, Nevada, Oregon, and Utah.

Water-Supply Paper 340–K pertains to the Pacific coast basins in California, which include Tia Juana, Sweetwater, San Diego, Bernardo, San Luis Rey, and Los Angeles rivers, draining areas to the south of San Francisco Bay; and San Joaquin, Sacramento, Russian, Eel, Mad, and Klamath rivers, which flow into the ocean through San Francisco Bay or north of it. With the exception of Klamath River and a few streams in Oregon that flow into Goose Lake, at the head of Pit River, all the streams in this division are entirely in California.

WATER-SUPPLY PAPER 341. Underground waters of the Coastal Plain of Georgia, by L. W. Stephenson and J. O. Veatch, and a discussion of the quality of the waters, by R. B. Dole. 1915. 539 pages, 21 plates, 4 text figures.

Gives the results of investigations made to determine the composition, structure, and stratigraphic relations of the formations of the Coastal Plain of Georgia and the geologic position, quality, quantity, and economic adaptability of the waters they contain. These topics are discussed first as applicable to the Georgia Coastal Plain as a whole and then as applicable to each county in this geologic province. Mr. Dole, who discusses the quality of the waters, concludes that all the underground waters of this province may be used advantageously for domestic and industrial purposes, although those from the later formations may require a little softening. He thinks also that the surface waters of this section are even better for industrial use than the ground waters, because they are lower in mineral content. The illustrations include a geologic map of the Coastal Plain of Georgia, a map of the underground water resources, a sketch map showing the relation of the drainage to the geologic structure, and halftone plates showing typical formations exposed by railroad cuts.

WATER-SUPPLY PAPER 342. Surface water supply of the Yukon-Tanana region, Alaska, by C. E. Ellsworth and R. W. Davenport. 1915. 343 pages, 13 plates, 5 text figures.

Describes briefly the general features of the Yukon-Tanana region, such as the geography, geology, climate, and water supply, and gives an account of the stream-measurement work and the establishment of gaging stations, with an explanation of the methods of carrying on the work and collecting the data. Contains tables showing the daily gage height and discharge of the various streams, and maps and other illustrations showing the hydraulic development of the region.

WATER-SUPPLY PAPER 343. Geology and water resources of Tularosa Basin, New Mexico, by O. E. Meinzer and R. F. Hare. 1915. 317 pages, 19 plates, 51 text figures.

Describes the physiography, drainage, and geology of Tularosa Basin, New Mexico, with special reference to its underground water resources and their availability for use in irrigation. Tularosa Basin, which includes about 6,000 square miles of arable land entirely shut in by mountain ranges so that it has no drainage outlets, is dependent upon its scanty rainfall and underground water for the growing of its crops. The paper outlines the routes of travel through the basin, briefly describing the watering places to be found on these routes, and contains analyses of some of the well, spring, and stream waters in this and adjoining areas. The illustrations include maps of the basin and adjacent country showing groundwater conditions, maps showing settlements, diagrams showing precipitation and its relation to altitude and other features, and sections of wells.

WATER-SUPPLY PAPER 344. Deschutes River, Oregon, and its utilization, by F. F. Henshaw, J. H. Lewis, and E. J. McCaustland. 1914. 200 pages, 28 plates, 8 text figures.

This report describes the general features of the Deschutes River basin and gives in concise form the results of measurements of stream flow for 1912 at each gaging station. It includes sections on the availability of the water supply, the economic distribution of the water, and the developed and undeveloped water sites, as well as a brief discussion of the old and new laws relating to water (which is necessary for a proper understanding of the water-right situation) and the relation of the Federal Government to the development of water power in this basin. Deschutes River is unique among western rivers in that its natural flow is constant and its headwaters afford reservoir sites so large and so well distributed that the total flow of the river may be utilized both for irrigation and for power. The paper is illustrated by a map of the basin showing the position of the gaging

stations, plans and profiles of Deschutes and Metolius rivers, and maps of many of the power sites. The report was prepared in cooperation with the State of Oregon.

WATER-SUPPLY PAPER 345–E. A method of determining the daily discharge of rivers of variable slope, by M. R. Hall, W. E. Hall, and C. H. Pierce. 1914. pp. 53–65, figs. 1–2.

WATER-SUPPLY PAPER 345–F. The discharge of Yukon River at Eagle, Alaska, by E. A. Porter and R. W. Davenport. 1914. pp. 67–77, Pls. IV–V, figs. 3–4.

Parts of Water-Supply Paper 345, "Contributions to the hydrology of the United States, 1914."

WATER-SUPPLY PAPER 345–G. The water resources of Butte, Montana, by O. E. Meinzer. 1914. pp. 79–125, Pls. VI–VIII, figs. 5–8.

Part of Water-Supply Paper 345. Gives the results of an investigation of the water resources of the small rock-bound basin in the center of which is situated the city of Butte, Mont. The investigation was made in response to an urgent request from the citizens of Butte for information as to the supply of ground water in the flat and the feasibility of developing it for industrial uses and for irrigation. The author concludes that the bedrock in this area forms a nearly water-tight basin but contains small quantities of water near the surface, where the rock is partly disintegrated, and in joints at greater depths. This bedrock will yield enough water in small quantities for domestic use but not enough for irrigation or industrial use. The deposits of clay, sand, and gravel which partly fill the basin are saturated with water below the water table, so that with proper methods of construction a yield of 100 gallons a minute from a single well can probably be developed in most parts of the flat, but flows of large volume should not be expected. The illustrations include a map of the basin discussed, showing water resources, a map of Silverbow Creek near Butte, and a diagram showing average monthly precipitation at Butte.

WATER-SUPPLY PAPER 345–H. Ground-water resources of the Niles cone and adjacent areas, California, by W. O. Clark. 1915. pp. 127–168, Pls. IX–XVII, figs. 9–24.

Part of Water-Supply Paper 345. Discusses briefly the physiography, drainage, and origin of ground-water supply of an area comprising the so-called Niles cone (the alluvial fan of Alameda Creek) and adjacent tracts in Santa Clara Valley, Cal., just east of the south end of San Francisco Bay, and describes the geologic formations in relation to ground water. This region is one of intensive farming, dependent on irrigation, and for more than 20 years there has been contention between the farmers and certain water companies that take large supplies from the Niles cone and tributary drainage basins to San Francisco and other cities on the bay. In the investigation resulting in this report an attempt was made to determine the source of the ground water, the quantity now being withdrawn, the amount available, and the area dependent on Alameda Creek. The author concludes that the ground-water supply is hardly adequate for the full irrigation of the area and the present-scale diversions by the water companies. The illustrations include maps of the area, well sections, and graphs showing fluctuations of the water table.

WATER-SUPPLY PAPER 345–I. Gazetteer of surface waters of Iowa, by W. G. Hoyt and H. J. Ryan. 1915. pp. 169–221.

Part of Water-Supply Paper 345. Embraces descriptions of all the streams named on the best available maps of Iowa, including the United States Geological Survey's base map of the State, county maps published in the annual report of the Iowa Geological Survey, and the topographic atlas sheets of the United States Geological Survey.

WATER-SUPPLY PAPER 346. Profile surveys in the basin of Clark Fork of Columbia River, Montana-Idaho-Washington, prepared under the direction of R. B. Marshall, chief geographer. 1914. 6 pages, 3 plates.

Describes briefly the general features of the Clark Fork basin and gives a list of the gaging stations maintained by the Geological Survey on the main stream and its tributaries. The paper contains plans and profiles showing the fall in the stream and conditions along the bank between Deer Lodge, Mont., and the international boundary.

WATER-SUPPLY PAPER 347. Profile surveys in Snake River basin, Idaho, prepared under the direction of R. B. Marshall, chief geographer. 1914. 12 pages, 3 plates.

Describes briefly the general features of the Snake River basin and gives a list of the gaging stations maintained by the Geological Survey on the main stream and its tributaries. The paper contains plans and profiles showing the fall in the streams and conditions along the banks of Snake River from Enterprise to Minidoka and of Salmon River from Salmon to its junction with Snake River.

WATER-SUPPLY PAPER 348. Profile surveys in Hood and Sandy River basins, Oregon, prepared under the direction of R. B. Marshall, chief geographer. 1914. 8 pages, 2 plates.

Describes briefly the general features of the Hood and Sandy River basins and gives lists of the gaging stations maintained by the Geological Survey on the two main streams and their tributaries. Contains plans and profiles of Hood River and of Sandy and Zigzag rivers and Camp and Still creeks above Marmot, Oreg.

WATER-SUPPLY PAPER 349. Profile surveys in Willamette River basin, Oregon, prepared under the direction of R. B. Marshall, chief geographer. 1915. 9 pages, 3 plates.

Describes briefly the general features of the Willamette River basin and gives a list of the gaging stations maintained by the Geological Survey on the main stream and its tributaries. Contains plans and profiles of Middle Fork of Willamette River and tributaries, Clackamas and Collawash rivers, and North Fork of Santiam River and tributaries.

WATER-SUPPLY PAPER 350. Profile surveys in Bear River basin, Idaho, prepared under the direction of R. B. Marshall, chief geographer. 1915. 7 pages, 1 plate.

Describes briefly the general features of the Bear River basin and gives a list of the gaging stations maintained by the Geological Survey on the main stream and its tributaries above the mouth of Logan River. Contains a plan and profile of the river from Riverdale to Novena, Idaho.

WATER-SUPPLY PAPER 353. Surface water supply of the United States, 1913, Part III, Ohio River basin, by A. H. Horton, W. E. Hall, and H. J. Jackson. 1915. 264 pages, 5 plates.

WATER-SUPPLY PAPER 354. Surface water supply of the United States, 1913, Part IV, St. Lawrence River basin, by C. C. Covert and W. G. Hoyt. 1915. 136 pages, 2 plates.

WATER-SUPPLY PAPER 356. Surface water supply of the United States, 1913, Part VI, Missouri River basin. N. C. Grover, chief hydraulic engineer. 1915. 291 pages, 2 plates.

WATER-SUPPLY PAPER 357. Surface water supply of the United States, 1913, Part VII, Lower Mississippi River basin, by Robert Follansbee and G. A. Gray. 86 pages, 2 plates.

WATER-SUPPLY PAPER 358. Water resources of the Rio Grande basin, 1888–1913, by Robert Follansbee and H. J. Dean, including Surface water supply of the United States, 1913, Part VIII, Western Gulf of Mexico basins, by Robert Follansbee, W. W. Follett, and G. A. Gray. 1915. 724 pages, 3 plates.

These reports present briefly the results of measurements of stream flow made in the drainage basins named during the calendar year 1913 and in the Rio Grande basin during the years 1888 to 1913, inclusive. Data for each gaging station are given under the following headings: Location, Records available, Drainage area, Gage, Channel, Discharge measurements, Artificial control, Winter flow, Accuracy, and Cooperation. The books contain also tables giving gage heights and daily and monthly discharges at each station and halftone plates representing typical gaging stations and current meters. Water-Supply Paper 353 gives, in addition, views of two bridges over Miami River at Hamilton, Ohio, taken during the flood of March–April, 1913, and Water-Supply Paper 358 contains a map of the Rio Grande basin showing the location of gaging stations and mean annual precipitation in New Mexico and Texas.

WATER-SUPPLY PAPER 363. Quality of the surface waters of Oregon, by Walton Van Winkle. 1914. 137 pages, 2 plates, 1 text figure.

A brief discussion of the constituents, uses, and purification of natural waters and a detailed consideration, by drainage basins, of the quality of the stream waters of Oregon, showing the nature and amount of the materials they hold in solution. The paper contains many analyses, which show that the river waters of Oregon are low in mineral content and are very good for general industrial use and for irrigation. The report was prepared in cooperation with the State of Oregon.

WATER-SUPPLY PAPER 364. Water analyses from the laboratory of the United States Geological Survey, tabulated by F. W. Clarke, chief chemist. 1914. 40 pages.

Contains 203 analyses, made in the chemical laboratory of the United States Geological Survey, of waters from rivers, lakes, wells, and springs in the United States as well as some mine waters. Most of these analyses have been published elsewhere, but many of the original documents are out of print and are therefore obtainable with difficulty.

WATER-SUPPLY PAPER 365. Ground water in southeastern Nevada, by Everett Carpenter. 1915. 86 pages, 5 plates, 3 text figures.

Gives an outline of the geography and geology of an arid region comprising about 17,000 square miles in Clark, Lincoln, Nye, and White Pine counties, Nev., and discusses the quality and source of its water supply. The watering places on routes of travel are briefly described and there is a table giving the approximate distances, in miles, between the chief watering places in this section of the State. The illustrations consist of maps of the area discussed, a diagram showing average monthly precipitation at several stations, sections across Spring Mountain, and halftone plates showing types of flowing wells in Las Vegas Valley and other geologic features.

WATER-SUPPLY PAPER 366. Profile surveys of Snoqualmie, Sultan, and Skykomish rivers, Washington, prepared under the direction of R. B. Marshall, chief geographer. 1914. 7 pages, 3 plates.

Describes briefly the general features of the Snohomish River basin and gives a list of the gaging stations maintained by the Geological Survey in the area drained by Snoqualmie, Sultan, and Skykomish rivers. Snohomish River is formed by the union of Skykomish and Snoqualmie rivers in the southwestern part of Snohomish County, Wash., and flows northwestward into Puget Sound. The paper contains plans and profiles showing the fall in the stream and conditions along the banks of Snoqualmie River and certain tributaries above Fall City, Sultan River above Sultan, and Skykomish River and certain tributaries above Gold Bar.

WATER-SUPPLY PAPER 367. Profile surveys of Missouri River from Great Falls to Three Forks, Mont., prepared under the direction of R. B. Marshall, chief geographer. 1914. 8 pages, 1 plate.

Describes briefly the general features of the Missouri River basin and gives a list of the gaging stations on the main stream in Montana maintained by the Geological Survey. Contains a plan and profile of the river from Great Falls to Three Forks, Mont.

WATER-SUPPLY PAPER 368. Profile surveys in Wenatchee River basin, Washington, prepared under the direction of R. B. Marshall, chief geographer. 1914. 7 pages, 1 plate.

Describes briefly the general features of the Wenatchee River basin and gives a list of the gaging stations maintained by the Geological Survey on the main stream and its tributaries. Contains a plan and profile of Wenatchee Lake, Wenatchee River, and certain tributaries.

WATER-SUPPLY PAPER 375–A. Ground water for irrigation in the Sacramento Valley, California, by Kirk Bryan. 1915. pp. 1–49, Pls. I–II, figs. 1–6.

Part of Water-Supply Paper 375, "Contributions to the hydrology of the United States, 1915." Describes briefly the geography and geology of Sacramento Valley. The water-bearing formations and the origin, movements, and development of the ground water are discussed, special attention being given to pumping problems. A relief map of northern California, showing outlines of Sacramento Valley, and an outline map of the valley, showing pumping areas and depth to water, as well as diagrams of the fluctuations of the water table at different points in the valley, make up the illustrations.

WATER-SUPPLY PAPER 375–C. The relation of stream gaging to the science of hydraulics, by C. H. Pierce and R. W. Davenport. 1915. pp. 77–84.

Part of Water-Supply Paper 375. Considers stream gaging as a branch of hydraulic engineering and concludes that, while a large amount of research is needed before hydraulics can be considered an exact science, yet the recent developments in stream gaging point to the possibility that this branch may in time reach a state of perfection so commensurate with the requirements imposed upon it that all problems connected therewith may be solved with mathematical exactness. When this ideal condition is attained the developments in the science of hydraulics that may be wrought by means of the current meter and the stop watch should be such as to justify the highest expectation of the most enthusiastic stream gager of to-day.

MINERAL RESOURCES OF THE UNITED STATES, CALENDAR YEAR 1913. 1914. Part I, Metals, clxxiii+901 pages, 8 text figures; Part II, Nonmetals, vi+1,617 pages, 9 plates, 26 text figures.

Statistics of the production, importation, and exportation of mineral substances in the United States, including accounts of the chief features of mining progress, comparisons of past and present production and conditions, and the application of the products in the useful arts. Contains four inserts showing (1) mineral products of the United States since 1904, (2) clay products of the United States in 1913, (3) production of coal in the United States since 1807, and (4) production of crude petroleum in the world since 1857. A consolidation of 62 advance chapters, each covering a single mining industry or group of allied industries.

MINERAL RESOURCES OF THE UNITED STATES, CALENDAR YEAR 1914; parts as follows:

The production of sand-lime brick in 1914, by Jefferson Middleton. 1915. pp. 1–7. Part II: 1.

Potash salts, 1914, by W. C. Phalen. 1915. pp. 9–33, Pl. I. Part II: 2.

The production of fuller's earth in 1914, by Jefferson Middleton. 1915. pp. 35–40. Part II: 3.

The production of phosphate rock in 1914, by W. C. Phalen. 1915. pp. 41–56. Part II: 4.

Fuel briquetting in 1914, by E. W. Parker. 1915. pp. 57–60. Part II: 5.

GEOLOGIC FOLIO 193. San Francisco (Cal.), folio, by A. C. Lawson. 1914. 24 folio pages of text, 10 maps, 5 structure-section sheets, 1 columnar-section sheet, 10 plates, 4 text figures. Price, 75 cents.

Description and maps of the San Francisco district, California, comprising the Tamalpais, San Francisco, Concord, San Mateo, and Haywards quadrangles, in Alameda, Contra Costa, Marin, San Francisco, and San Mateo counties. Large parts of four of these quadrangles cover the waters of the Bay of San Francisco or of the adjacent Pacific Ocean. The matter contained in this folio is to be published also in octavo form, price 75 cents.

GEOLOGIC FOLIO 194. Van Horn (Tex.) folio, by G. B. Richardson. 1914. 9 folio pages of text, 2 maps, 1 structure-section sheet, 9 plates, 6 text figures. Price, 25 cents.

Description and maps of the Van Horn quadrangle, comprising about 1,019 square miles in El Paso and Culberson counties, Tex.

GEOLOGIC FOLIO 195. Belleville-Breese (Ill.) folio, by J. A. Udden and E. W. Shaw. 1915. 13 folio pages of text, 4 maps, 1 columnar-section sheet, 13 text figures. Price, 25 cents.

Description and maps of the Belleville and Breese quadrangles, comprising about 467 square miles in Bond, Clinton, Madison, and St. Clair counties, Ill.

TOPOGRAPHIC MAPS as follows:

Alaska (Territory).
Ames, Iowa.
Avena, Cal.
Axial, Colo.
Baldwin, Ill.
Battle Lake, Minn.
Benson, Ariz.
Boring, Oreg.
Burnham, Cal.
Chester, Ill.-Mo.
Chitina, Alaska.[2]
Churubusco, N. Y.
Cincinnati, Ohio-Ky.[3]
Clintwood, Va.-Ky.
Corning, N. Y.
Coshocton, Ohio.
Crawford, W. Va.
Crow Creek, Idaho-Wyo.
Crystal City, Mo.-Ill.
Cuskers, Mont.
Deerwood, Minn.
Douglas, Ariz.
East Cincinnati, Ohio-Ky.[3]
Elkhorn Weir, Cal.
Fredericktown, Ohio.
Gambier, Ohio.
Gillespie, Ill.
Grand Rapids, Mich.
Hereford, Ariz.
Hindman, Ky.
Hominy, Okla.
Hoquiam, Wash.
Houghton, Mich.
Kern River oil field, Cal. (2 sheets).[4]
Kirkville, Cal.
Lanes Creek, Idaho.
Lathrop, Cal.
Little Muddy, Ky.
Longs Peak, Colo.
Loudonville, Ohio.
Macomb, Ill.
Malaga, Wash.
Manteca, Cal.
Marengo, Ohio.
Massachusetts, Rhode Island, and Connecticut (States).[1]
Meadow Creek, W. Va.
Merritt, Cal.
Mesa, Ariz.
Mesa Verde National Park, Colo.
Milford, Pa.-N. Y.-N. J.
Milton, Vt.
Montana (State).[1]
Monument Butte, Colo.
Morenci, Ariz.-N. Mex.[5]
Mount Baker district, Wash.
Mount Morrison, Cal.-Nev.
Mount Olive, Ill.
Mount Rainier National Park, Wash.
Murphy, Tenn.-N. C.[3]
Nemaha, Nebr.-Mo.
Nowata, Okla.[6]
Number Four, N. Y.
Nyack, Mont.
Oregon (State).[1]
Oregon City, Oreg.
Ottawa, Ill.[6]
Palatka, Fla.
Perham, Minn.
Perrysville, Ohio.
Petaluma, Cal.
Peters, Cal.
Pine, Oreg.-Idaho.
Platte County, Mo.
Port Valdez, Alaska.
Pound, Va.-Ky.

[1] Photolithograph.
[2] Reprint of Plate I, Bulletin 374.
[3] New edition; revised in field.
[4] Formerly Oil Center; revised in field and enlarged.
[5] Formerly Boyles.
[6] Resurveyed and reengraved.

Priest Valley, Cal.
Reading, Pa.[1]
Renault, Ill.-Mo.
Ronda, Cal.
Roxabell, Ohio.
Sago, W. Va.
San Francisco and vicinity, Cal.
San Francisco Bay (sheet J-10 of world map).
Seaford, Del.-Md.
Soda Canyon, Colo.
Spring Creek, Mont.
Sunnyside, Utah.
Swingle, Cal.
Todd Lakes, Mont.
Troy, Ohio.
Tule Valley, Mont.
Underwood, Minn.
Union Island, Cal.
United States (2-sheet base map).[2]
United States (2-sheet contour map).[2]
Vergas, Minn.
Vermont and New Hampshire (States).[3]
Vernalis, Cal.
Vincennes, Ind.-Ill.
Virginia (State).[3]
Walker Creek, Cal.[4]
Washington (State).[3]
West Cincinnati, Ohio-Ky.[5]
Wyoming (State).[3]
Yerington district, Nev.
Yolo, Cal.

GEOLOGIC BRANCH.

SCOPE OF WORK.

The geologic branch is responsible for the geologic work of the Survey. Its original duties, as defined in the act establishing the Survey, were "the classification of the public lands and the examination of the geological structure, mineral resources, and products of the national domain." These duties were at first construed to apply only to the public-land States. Later, however, in order that all parts of the country might share alike in the benefits of its work, the Survey was specifically authorized "to continue the preparation of a geological map of the United States," the scope of its operations being thus made nation-wide. Since that time (1882) the investigations necessary to the fulfillment of the Survey's obligations to the public have become as varied as the aspects of geology itself.

At present the geologic branch is not only the effective agency of the Survey in the geologic investigations carried on by the Government in all parts of the United States and Alaska but also the great geologic information bureau to which the American public, from Key West to Point Barrow and from San Diego to Eastport, applies for knowledge of every sort concerning the earth's crust and its mineral constituents. To the people of this country and, in a surprising degree, to the citizens of other countries, the Survey is the principal source of geologic information regarding not only the geology of the United States and its possessions but also that of Mexico, Central America, and even South America. Through its correspondence it is asked for data regarding the geology and mineral deposits of all parts of the world. The geologic branch has therefore the double task of geologic surveying, including the investigation, description, and mapping of the geology and mineral deposits of all parts of the country, the classification of the public lands, and the publication of the results of

[1] Resurveyed and reengraved.
[2] Revised map; published in new form.
[3] Photolithograph.
[4] Preliminary edition showing part of quadrangle.
[5] New edition; revised in field.

its work on the one hand, and of furnishing to the public miscellaneous geologic information derived from all sources on the other.

ADMINISTRATION.

For the more efficient and systematic accomplishment of its work, the geologic branch is organized in four divisions—geology, David White, chief geologist, in charge; Alaskan mineral resources, A. H. Brooks in charge; mineral resources, H. D. McCaskey in charge; chemical and physical researches, G. F. Becker in charge. These divisions, though as nearly autonomous as is practicable without loss of efficiency and strength in the organization as a whole, cooperate effectively. Most of the statistical reports of the division of mineral resources are prepared by members of the division of geology who are specialists in the geology of the respective mineral deposits and whose field investigations give opportunities for close observation of the mineral industries. In paleontologic and other laboratory investigations there is free exchange of assistance between the division of Alaskan mineral resources and the division of geology. Field investigations are occasionally made by members of the division of chemistry and physics under the auspices of the division of geology.

The chief geologist plans the geologic investigations to be carried on by the Survey in the United States and has general supervision of the work. He gives special attention to cooperation in geology with the State surveys and devotes such time as is available to him for field work to field inspections and conferences with geologists and chiefs of sections and to the direction and inspection of the work of the section of eastern fuels.

PUBLICATIONS.

The publications of the fiscal year 1915 prepared wholly or partly in the geologic branch embrace 1 monograph, 34 professional papers, bulletins, etc., 92 chapters of reports later published as annual volumes, and 3 geologic folios. Titles and brief abstracts of these publications are given on pages 16–37. Besides the official publications, 56 papers were, with the permission of the Director, published in scientific journals and in the publications of scientific societies. Eight reports, based on work done in cooperation with State geological surveys, have, in accordance with the cooperative agreements, been transmitted to the States for publication. On the other hand, three somewhat extensive geologic reports, prepared by the State organizations under the same agreements, have been submitted for publication by the Federal Survey, and others are in preparation by the States. In the preparation of the reports of mineral production some of the material relating to certain of the industries in the different States is compiled by the State geologists.

AREA GEOLOGICALLY SURVEYED IN THE UNITED STATES DURING THE YEAR.

On account of the differences in the nature of the work performed, it is difficult to estimate areas covered by all the geologists in square miles of detailed areal, detailed reconnaissance, and reconnaissance mapping. However, calculations, in which examinations for inspection, paleontologic studies, revision, and local investigations have been omitted, furnish the following results for the fiscal year ended June 30, 1915.

Areas covered by geologic surveys, fiscal year 1914–15.

	Square miles.
States east of the one-hundredth meridian:	
Detailed areal	3,346
Detailed reconnaissance	1,830
Reconnaissance	36,650
States west of the one-hundredth meridian:	
Detailed areal	10,411
Detailed reconnaissance	4,705
Reconnaissance	10,705
Total in the United States:	
Detailed areal	13,757
Detailed reconnaissance	6,535
Reconnaissance	47,355

The areas in the United States covered by geologic maps published by the Survey and the general nature of the work in each area are shown on Plate I, which does not, however, indicate areas for which reports, prepared by this Survey, have been submitted for publication to cooperating State organizations or to other bureaus and departments of the Federal Government.

The progress of geologic surveying in Alaska is described in the section on the division of Alaskan mineral resources (pp. 92–99).

DIVISION OF GEOLOGY.

ORGANIZATION.

The scientific force of the division of geology at the beginning of the year consisted of 66 geologists, 33 associate geologists, 26 assistant geologists, 15 junior geologists, and 22 geologic aids. During the year eight members of the scientific staff resigned to take positions in private life at higher salaries, two members were transferred to the land-classification board, and 12 members were appointed. The total number of geologists of various grades on the staff at the end of the year was 164. Of this number, 81 were employed continuously, 35 gave only part of their time to Survey work, and 48 were not employed.

The division of geology is organized in nine sections, as follows:

1. Section of eastern areal geology (east of the one-hundredth meridian).
2. Section of western areal geology (west of the one-hundredth meridian), including the subsection of investigations in petrology.
3. Section of Coastal Plain investigations.
4. Section of glacial geology.
5. Section of paleontology and stratigraphy.
6. Section of metalliferous deposits.
7. Section of nonmetalliferous deposits.
8. Section of eastern mineral fuels (east of the one-hundredth meridian).
9. Section of western mineral fuels (west of the one-hundredth meridian).

The section of geologic-map editing, although a part of the publication branch, comes under the general supervision of the chief geologist.

ALLOTMENTS.

The total funds available for the geologic work of the Survey in the United States for the year 1914–15 were as follows:

Geologic surveys	$400,000
Statutory salaries	13,700
Search for potash deposits (part of the appropriation for chemistry and physics)	16,150
	429,850

The allotments of the appropriations were as follows:

Section of eastern areal geology	$24,700
Section of western areal geology	47,700
Section of Coastal Plain investigations	12,400
Section of glacial geology	7,175
Section of paleontology and stratigraphy	23,500
Section of metalliferous deposits	47,855
Section of nonmetalliferous deposits (including potash)	38,750
Section of eastern fuels	31,800
Section of western fuels	57,610
Geologic map editing	7,020
Débris investigation and inspection	4,400
Supervision, administration, salaries of clerical, technical, and skilled labor forces, instruments, supplies, and contingent fund	95,440
	398,350
Land-classification board	31,500

Of the amounts allotted to this division, approximately $309,900 was expended directly for geologic work, including the search for potash. Of this amount, about $208,540, or 67.3 per cent, was expended west of the one-hundredth meridian and $101,375, or 32.7 per cent, east of the one-hundredth meridian. If, however, the $31,500 for the operations of the land-classification board is included, 70.3 per cent of a total approximating $341,415 was spent for investigations west of the one-hundredth meridian—that is, essentially in the public-land States. The allotment for supervision, etc., is

divisible in very nearly the same proportions between the eastern and western work.

COOPERATION WITH FEDERAL BUREAUS AND STATE SURVEYS.

In strictly geologic field investigations or paleontologic studies the Survey cooperated through the division of geology with 17 States—Georgia, Illinois, Iowa, Kentucky, Maryland, Michigan, Minnesota, Mississippi, Missouri, New Jersey, North Dakota, Oklahoma, Oregon, Pennsylvania, Tennessee, Virginia, and Wisconsin. Informal cooperation, without specific financial obligations, exists between most of the other States having geological surveys.

The Survey cooperates with the Bureau of Mines in the metallographic study of ores, in the investigation of the invasion of California oil wells by salt water, in studies of the application of geology to engineering problems of mining and construction, and in the examination of placers and placer mining in the United States. The Survey is also engaged with the Bureau of Standards, the Bureau of Mines, and the Office of Public Roads in a thorough and systematic study of the building stones of the United States. Through the division of geology it also cooperated informally with the Smithsonian Institution, the Bureau of Fisheries, the Forest Service, the Navy Department, the War Department, and the Lighthouse Service, as well as with a number of institutions of learning, including, in particular, the Geophysical Laboratory and Marine Biological Station of the Carnegie Institution. Services varying in extent have, during the year, been rendered to the Department of Agriculture in the examination of lands in the national forests; to the Department of Justice in connection with its suits regarding public lands; to the Navy Department in regard to oil and water supplies; to the Office of Indian Affairs in the classification of Indian lands in Arizona, Washington, New Mexico, and Oklahoma; to the War Department with reference to water supplies in its reservations; and, most important of all, to the General Land Office in the classification of withdrawn coal, oil, and phosphate lands.

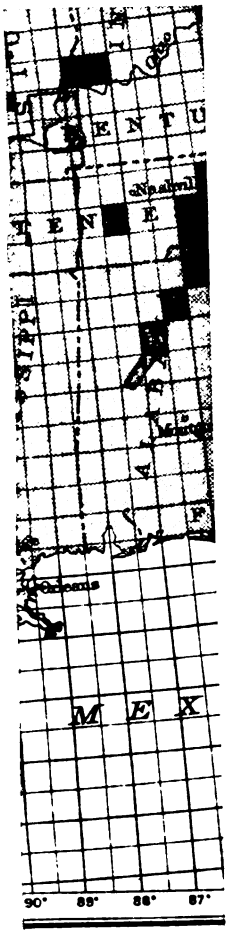
The geologic work of the division, both in the field and in the office, is under the immediate supervision of the chiefs of the respective sections, who are directly responsible for maintaining efficiency and a high standard of work. Exceptions are made of the studies of detrital deposition in California, completed by G. K. Gilbert under the joint auspices of the geologic and water-resources branches, the general descriptions by Mr. Gilbert of the structure in the Great Basin region, and the general monographic description of the geology of the Yellowstone National Park, in preparation by Arnold Hague. The work of these distinguished senior geologists of the Survey is reported directly to the chief geologist.

GENERAL FEATURES OF THE WORK OF THE YEAR.

The more important scientific and economic investigations in progress in the division of geology were briefly described in the report for last year, pages 34–36, 71–74; this year reference will be made only to those features of the work that may be either new or noteworthy as to progress, as to changed conditions, or as to policy.

The most important item affecting the work of the geologic branch during the year was the increase in the appropriation for geologic surveys from $300,000 to $400,000. This was a net addition of but $65,000 to the funds of the branch, however, for $35,000 of the new appropriation was required merely to replace the amount which, for several years, had been contributed by the General Land Office to the cost of the Survey work in the classification of the public lands. The net gain in available funds has been used to enlarge the operations of all sections; but the largest proportion, in accordance with the understood spirit of Congress in voting this increase, has been devoted to the classification and valuation of lands in the public domain.

In the search for potash no clue has been neglected. In accordance with plans made the previous year, a deep well was drilled in the season of 1914 near the center of the Black Rock Desert, in western Humboldt County, Nev. Because of the late date (August 1) on which the appropriation bill was passed, the beginning of work was much delayed. However, when once started, the drilling was remarkably free from delay or mishap and on November 16 was completed to a depth of 1,500 feet. The cost of the work as carried out by the Survey with its own equipment was far less than the amount named in the lowest of the bids received for it, all of which were rejected. No bed of potash or other salts, in massive form, was encountered in this well. Nevertheless, the test is not considered conclusive as to the hypothesis that buried saline deposits remain in some of these basins as the result of the drying up of the lakes of Nevada, eastern California, and southern Oregon in Quaternary time. The field to be explored is large, and both the funds and the facilities for exploration have limited the trials to a few localities. The hypothesis on which this exploration, which is in charge of H. S. Gale, has been based deserves further test in the hope that potash-rich salt muds or brines, similar to or more concentrated than those found at Searles Lake, Cal., may be found in other places. In connection with this drilling a study of the sediments composing the beds penetrated by the drill, by the use of the microscope and soil analyses, was begun by M. I. Goldman in order to procure information as to the climatic and other conditions prevailing at different times during the long period in which the lake basin was being filled and converted into a desert. All drill samples containing salts in appreciable quantities were subjected to chemical tests.



PUBLISHE

The geologic formations which, from the evidence in hand, are regarded as more likely than others to contain buried potash salts in commercial amounts are the Quaternary lake beds in the Great Basin region of the West and the Permo-Triassic red beds of the Rocky Mountain States, Kansas, Oklahoma, and Texas. Whether or not the Quaternary lake province is the one which contains the larger potash-bearing deposits, it would at least appear that the centers of desiccation can be more readily as well as more accurately located in that province and that the drilling adequate for testing can therefore be accomplished with better data for guidance as to locations, with a comparatively small number of deep holes, and at far less cost. The results of exploratory boring in Searles Lake and the shallowly buried salt beds in Death Valley, Cal., establish a degree of validity for the Quaternary lake basin hypothesis and certainly encourage testing in other basins, though it is, of course, quite possible that, on account of geologic conditions not to be detected at the surface of the ground, no other deposits of importance may be present in any other basins. Certain of the basins may safely be condemned on the physiographic and geologic evidence, but beyond the limits of geologic interpretation the question can be determined only by patient search with the drill. A new drilling outfit, specially designed for the work, was purchased in the spring of 1915, supplies were ordered, and other preparations made for drilling at the beginning of the new fiscal year, at localities already selected by Mr. Gale in the Smoke Creek Desert, Nev., which will next be tested.

Studies of the red beds have been carried on in Wyoming, Colorado, Arizona, and New Mexico, in order to define as nearly as possible the basins of sedimentation in Permo-Triassic time and so indirectly, if not directly, to locate the centers of extensive desiccation of the red-bed areas. That there has been desiccation on a great scale in these regions is shown by thick deposits of salt and gypsum in the red beds over large areas. Search is being made for the basins and portions of basins in which saline deposits are the most numerous, as well as thickest, and in which, especially, there may be evidence of the complete drying out of the sea. Samples are gathered, wherever conditions are suitable, for testing in the laboratory. In June the field examinations of the red-bed outcrops in eastern New Mexico was resumed by N. H. Darton, one of the geologists most familiar with the stratigraphy of these formations.

Hope for the discovery of potash deposits in the red beds of the Southwest is encouraged by the detection of slight potash indications in the west-central region and in the Panhandle of Texas. The first of these reported indications was noted at Spurr, in Dickens County, Tex., by Dr. J. A. Udden, of the bureau of economic geology and

technology in the University of Texas, while examining the records and drillings of wells in the Paleozoic regions of Texas, as special agent of this Survey. Subsequent drilling in the region has been investigated, with the discovery of additional traces of potash in the Panhandle, not far from Amarillo, by the State University bureau under the direction of Dr. William B. Phillips.

Evidence warranting boring especially for potash salts by the Government, if not by private parties, at some point in the red-bed region may at any time result either from the geologic examinations now in progress or, as is possibly more likely, from the chance discovery of potash indications or even of a valuable deposit in some well drilled for oil or water. The red beds are very extensive, covering portions of several States in a continuous formation. Pending the conclusions drawn from the geologic studies as to the probable centers of greatest saline deposition in this region, there may be little choice of location throughout large areas. Consequently random locations in untested areas by drillers for oil, gas, or water probably offer, if the drilling is properly conducted with adequate scientific observation, collection of cuttings and brines, and chemical analyses, as good chances for the discovery of potash salts as drill holes located by the Government in advance of the geologic studies. Hence every effort is made to cooperate with all drillers who may be boring in the regions which are under examination or which it is thought may contain large saline deposits. Sample bags and specially prepared log books are furnished to them with the request that cuttings be taken from every "screw," at least in the regions of the formations containing or adjacent to the saline or gypseous deposits. Also samples of brines are solicited. All these samples are tested for potash in the laboratory of the Survey, and the drillers are informed as to whether potash is present in considerable amounts in any of the samples. In the lack of funds sufficient to carry on the exploration more rapidly and especially to conduct boring operations in several areas at once, the effort will be made, whenever possible, to station scientific observers at the sites of new drillings in areas which would appear to be especially promising or in which indications have been reported, in order that the cuttings of the drill may be watched on the ground by a competent observer and tests made of the samples and brines as the work progresses.

It is hoped that drillers for oil and water, not only throughout the red-bed region but in the salt-bearing regions of the Salina and other formations in the Eastern States, may be interested to take advantage of the cooperation of the Geological Survey in the examination of their drill records and cuttings, in order that the possible presence of potash deposits of value in any of these regions may be recognized. In portions of the saliferous areas in the more thickly

settled Eastern States such cooperation by the drillers would easily afford adequate exploration. Wildcat borings in new districts, located in unexplored depositional basins, are of particular importance, and special effort is therefore made to engage the interest of drillers at such points in the examination of their borings by the Survey. There are, however, large areas, especially in the red-bed region, in which no boring is in progress or possibly even contemplated so far as is known to the Survey. In view of the urgent need for the discovery of potash and nitrate supplies within the territory of the United States, it is greatly to be regretted that the funds available for this search are not sufficient to permit exploration on a larger scale through the employment of several drill rigs, operating at once in a number of the relatively favorable regions.

In addition to the explorations above described, the Geological Survey is testing all samples sent to it for examination from reported discoveries of potash salts or nitrates. It has also made field investigations of reported deposits concerning which the tests have been favorable, and the information submitted with the samples has warranted the hope that the deposits might prove to be of value. Many of the samples forwarded contain no potash or nitrates in notable quantities. With few exceptions the deposits have been too lean or, especially the nitrate deposits, too small, though fairly numerous, to be commercially important. A large number of wells, earths, brines, and prospects have been examined in the field, as well as in the office, and considerable attention has been given to the examination of brines from developed salt or bromine producing fields and from the salt-dome oil fields.

In many lines the geologic work of the Survey is showing marked tendency toward greater exactness of method, with corresponding greater definition of results. The exploratory, reconnaissance, and qualitative methods are gradually being supplanted by detailed examinations, and with the more general application of engineering methods the results are in larger measure quantitative. This is most apparent in the work of land classification. In the classification of coal lands, as described in Bulletin 537, the determinations of geologic boundaries of outcrops of coal beds, and of key rocks, as to geographic position, dip, and elevation, are made instrumentally. The economically valuable beds are more frequently prospected and sampled, their variability and continuity are more systematically noted or calculated, and, finally, depths, tonnage, and values are computed. Comparable methods are now employed also in the survey of iron deposits, the examinations for possible oil pools, and the classification of phosphate lands. Gradually and systematically data are being gathered in the different regions for a tonnage estimate of the wealth of the United States in calcium phosphate. The problem of exploiting,

manufacturing, and marketing this priceless endowment of phosphate in such ways as will lead to its larger use by the American farmer is worthy of the most serious consideration. It is an economic misfortune and a reproach that so large a proportion of the phosphate rock (35 per cent of the total production of 2,734,043 tons in 1914) now mined in this country is shipped abroad to enrich the soils of foreign countries while the soils of the United States are in general becoming slowly impoverished. With a rapidly increasing urban population to be fed, we are confronted by a waning crop production to the acre, and, in the end, by an adverse balance of foreign trade that must be met by a gradual sacrifice of our unreplaceable mineral resources, either in manufactured forms or in the raw state, instead of by products of the soil that may be renewed without exhaustion of the source.

To supply the need for general information, accurate though condensed, as to the coal fields of the country, descriptive summaries, with maps, similar in some respects to those published in the Twenty-second Annual Report of this Survey, are being prepared for issue as parts of a general report on the coal fields of the United States, under the supervision of M. R. Campbell. In this report, for which there is a constant and large demand, the coal resources of the many fields will be differentiated and, with additional and more precise data than have hitherto been available, will be recalculated quantitatively in revision of the estimates by Mr. Campbell printed in Mineral Resources for 1907 and of those later prepared by the Survey for publication in "Coal resources of the world," under the auspices of the International Geological Congress which met in Toronto, Canada, in 1913.

Comparable in some respects to the engineering and quantitative methods of investigation applied to some of the nonmetalliferous and fuel deposits is the systematic study of the metalliferous deposits by natural provinces or by large geographic units, such as States. Comprehensive and systematic studies like those of the mining districts of Utah, by B. S. Butler, or of Idaho, by J. B. Umpleby, both now in progress under the direction of F. L. Ransome, can not fail to give a better knowledge of the general conditions of occurrence and modes of association of the different ores, the origin and characteristics of the deposits, and their limitations and adaptations with reference to different treatments. Nevertheless, such more comprehensive investigations can not relieve the Survey of the necessity for reconnaissance examinations of newly discovered or newly developing districts and for the special study of the geology of deposits which present new or unusual features and of those which, though not now valuable, may hereafter become so.

The progress of knowledge as to the origin of metalliferous deposits, a line of early geologic inquiry, is marked possibly more strongly than ever by a broadening of the methods of investigation. This is shown in the increasing diversity of the researches in geology, chemistry, and physics contributory to the solution of the problem. The studies of the enrichment of ore deposits demand, among other things, the understanding of paleogeographic conditions, the interpretation of geologic history, and the paleontologic determination of the time elements concerned. More observations must be made of the influence of various minerals on the deposition of metals, such as silver, or of other minerals, from solution, as is shown by E. S. Bastin and Chase Palmer in their studies of silver enrichment. Further, the metallographic microscope, with its photographic attachment, supplements the petrologic microscope and chemical methods in the differentiation of the opaque minerals and the study of their mode of association and their origin. By this means supposed chemical compounds have been shown to be mere mixtures of minerals, and relations previously unsuspected or unproved have been discovered. Inasmuch as the metallographic study of the relations and mode of association of the individual minerals in composite ores promises to give aid in separating and reducing such ores, as well as in solving the problems regarding the origin of the ores, this study is recognized as of direct and mutual concern both to the Geological Survey and to the Bureau of Mines. Accordingly, the work of F. B. Laney is carried on under the joint auspices of the two bureaus. That part of the investigation which concerns the genesis of the ores and their deposition falls naturally within the province of the Geological Survey, while the application of the ascertained facts concerning the genesis of the ore minerals, their association in the rock, and their mechanical differentiation is to be made by the Bureau of Mines in the solution of problems of successful treatment and utilization. In these studies biochemistry also must be considered, as it is in the study of the deposition of iron oxide by E. C. Harder.

Another inquiry that may have far-reaching significance with reference to the occurrence and relations of metals and other substances as now found in the earth is illustrated by the experiments made by C. E. Van Orstrand on the diffusion of solids, which are more fully mentioned in the account of the work of the division of chemistry and physics.

Recognizing that the ability to form a correct judgment as to the practical utilization and value of an ore or other mineral deposit in the ground is most effectively acquired through the field observation of operating works and processes for the exploitation and reduction of the same or similar deposits, the Survey regards it of the highest

The foregoing sketch of some of the features of the work of the division of geology that appear to be noteworthy does not include some of the most important scientific work, which is too well known to require special comment.

SCOPE OF THE WORK OF THE SECTIONS.

The work of the several sections of the division of geology is briefly outlined in the following synopsis:

1. The section of eastern areal geology—Arthur Keith, geologist in charge—conducts reconnaissance and detailed work in areal or general geology in regions east of the one-hundredth meridian, the primary object of which is to make known, mainly through folios of the Geologic Atlas, the general geology of the region studied, or to prepare scientific and educational descriptions of it, rather than to examine and describe or map the area especially on account of some geologic problem or some particular economic resource. The work of this section is carried on in close cooperation with several State surveys and university departments of geology, an effort being made to coordinate the work of all participants. During the year the operations of the section have covered areas in Alabama, Arkansas, Delaware, Kentucky, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Vermont, and Virginia.

2. The work of the section of western areal geology (west of the one-hundredth meridian)—F. L. Ransome, geologist in charge—corresponds to that of the section of eastern areal geology and is similar in scope, these sections being especially charged with the preparation of the folios of the Geologic Atlas of the United States.

Four geologic railway guides, designed primarily for the benefit of travelers to the Panama-Pacific Exposition, have been prepared under the general auspices of this section. Field work was begun by six geologists early in June, 1914, and was continued into the autumn. One of the four resulting bulletins (Bulletin 612) has already appeared and is described on page 27.[1] The activities of the section have concerned the States of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oklahoma, Oregon, South Dakota, Utah, and Washington.

3. The section of Coastal Plain investigations—T. Wayland Vaughan, geologist in charge—is occupied primarily with the study of the numerous geologic formations of the Atlantic and Gulf Coastal Plain, their character, extent, general structure, correlations, conditions of deposition, and geologic history, and especially of the underground-water resources of the region. Incidental attention is given to other mineral resources which are more particularly consid-

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ered by other sections. Because of their importance in accurately tracing the different geologic formations and in supplying a reliable basis for geologic correlation, the fossil organisms entombed in the different formations are carefully studied. Most of the areal work of this section during the year has been of the reconnaissance type. Its office investigations are comprehensive and broadly scientific, as well as economic. The National Museum, the Bureau of Fisheries, the Carnegie Institution, and a number of specialists in biology or paleontology, as well as the division of underground waters of the water-resources branch, have cooperated with or contributed to the work of this section.

Investigations have been carried on by this section during the year in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Massachusetts, Mississippi, North Carolina, Rhode Island, South Carolina, Tennessee, Texas, and Virginia.

4. The section of glacial geology—W. C. Alden, geologist in charge—is engaged in the study of the work of glaciers, the glacial and interglacial deposits and the contemporary deposits of the bordering regions, and the geologic history of the continent during the Quaternary period. The geologists occupied with these varied and specialized problems are charged with the classification and mapping of the Quaternary deposits of the glaciated regions. The work of this section during the year has comprised field studies and mapping and the preparation of reports covering areas in Illinois, Indiana, Iowa, Massachusetts, Michigan, Minnesota, New York, North Dakota, Vermont, and Wisconsin.

5. The section of paleontology and stratigraphy—T. W. Stanton, geologist in charge—is responsible for the determination of the relative age and equivalence of the strata in different areas and for the reference of the formations to a geologic time scale. The examination of current collections of fossils and the preparation of reports on them for the use of geologists engaged in areal mapping and special investigations occupy a large proportion of the time of the paleontologists. The geologists who specialize in paleontology are engaged also in working out the sequence and character of the continental changes, the physiographic and climatic conditions of the various periods, and the history of the animal and plant life of the geologic epochs. The field study of the stratigraphic distribution of the fossil floras and faunas gives the most complete key to the correlation of the beds; hence the paleontologists can most efficiently accomplish their work by close cooperation with the areal and economic geologists. The work of this section is practically coextensive with that of the divisions of geology and of Alaskan mineral resources and is indispensable to the geologic mapping of the areas surveyed and the satisfactory determination of the structure. The States receiving most

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9. The section of western fuels—M. R. Campbell, geologist in charge—conducts examinations and surveys in the fuel-bearing areas west of the one-hundredth meridian similar to those carried on by the section of eastern fuels. The greater part of the work of the western section has consisted in classifying and mapping coal or oil bearing lands of the public domain in California, Colorado, Montana, New Mexico, North Dakota, Oregon, Utah, and Wyoming, but a part of the work in this section was done in quadrangle units for folio publication, subject to the approval of the geologist in charge of the section of western areal geology.

The section of geologic-map editing—G. W. Stose, geologist in charge—is a part of the publication branch, but its work is so intimately associated with the work of the individual geologists in the division of geology that it is administered as a part of the geologic branch, in which the chief of the section is an active geologist. The geologic field investigations made by Mr. Stose are reported in the work of the sections to which they pertain.

ASSISTANCE TO OTHER DIVISIONS.

In addition to performing work in their respective sections, a considerable number of the geologists in the sections of metalliferous and nonmetalliferous deposits and several geologists in the sections of eastern and western areal geology have prepared for publication, in the annual volumes of Mineral Resources, reports on the production and statements of the industrial conditions relating to a large number of mineral resources with which they are especially familiar. Parts of the salaries of some of these geologists are paid from the funds of the division of mineral resources, and the traveling and field expenses incurred by others in the collection of data are also paid from the funds of that division.

A number of economic geologists of this division serve as members of the special committees of the land-classification board. The paleontologists of the division report on fossils collected for the division of Alaskan mineral resources and are called upon to classify fossils for the National Museum and, through courtesy, occasionally for foreign governments and other scientific institutions.

Close cooperation, with constant interchange of information, exists between the geologic branch and the water-resources branch in the investigation of underground-water movements and supplies and of sedimentary deposition. Members of the land-classification board serve in the geologic field parties.

COMMITTEE ON GEOLOGIC NAMES.

The committee on geologic names is a standing committee of the geologic branch, consisting of T. W. Stanton (chairman), M. R. Campbell (vice chairman), W. C. Alden, G. H. Ashley, Arthur Keith, F. L.

attention from this section during the year were Alabama, Arkansas, Colorado, Florida, Georgia, Idaho, Indiana, Kentucky, Maine, Maryland, Missouri, Montana, North Dakota, Oklahoma, South Dakota, Tennessee, Virginia, Wisconsin, and Wyoming.

6. The section of metalliferous deposits—F. L. Ransome, geologist in charge—not only studies metalliferous deposits and mines and investigates the conditions and methods of ore deposition, but also carries on reconnaissance geologic examinations of many new districts and makes complete detailed areal surveys, for folio publication, of quadrangles in which metalliferous deposits are of special importance, the folios being subject to the inspection and approval of the geologists in charge of areal geology. The geologists of the section have been engaged on projects in Alabama, Arizona, California, Colorado, Georgia, Idaho, Kansas, Louisiana, Minnesota, Missouri, Montana, Nevada, New Mexico, Oklahoma, Oregon, Tennessee, Texas, Utah, Washington, and Wyoming.

7. The section of nonmetalliferous deposits—Hoyt S. Gale, geologist in charge—is concerned with the study of the deposits of nonmetallic ores and minerals, exclusive of fuels, and with the geologic investigation and mapping of regions in which such minerals or deposits are of paramount importance. During the year the greater part of the work of the section has been divided between the search for potash in commercial quantities in the salts of the old evaporation basins or dried-up ancient lakes of the Southwest and the classification of the phosphate-bearing lands withdrawn from entry in Idaho and Wyoming. Special investigations relating to clays, building stones, the eastern phosphate fields, and mica have also been carried on. The work in this section relates in particular to Alabama, California, Colorado, Connecticut, Georgia, Idaho, Kentucky, Massachusetts, Maryland, Minnesota, Nevada, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oregon, Tennessee, Texas, Utah, Virginia, West Virginia, and Wyoming.

8. The section of eastern fuels—David White, geologist in charge—conducts examinations of areas east of the one-hundredth meridian containing coal, oil, or gas. It not only investigates and describes the economic geology, but in some regions also works out the detailed areal geology for folio publication, the folios being subject to the inspection and approval of the geologist in charge of the section of eastern areal geology. The work of the section during the year has been conducted in cooperation with the State surveys of Illinois, Missouri, Minnesota, Oklahoma, Pennsylvania, Tennessee, and Virginia. Noncooperative work has been done in Arkansas, Georgia, Indiana, Iowa, Kansas, Louisiana, Mississippi, Ohio, Texas, and West Virginia.

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Ransome, G. W. Stose, and David White. The minutes and other records are kept by the secretary, Miss M. G. Wilmarth, who also scrutinizes the geologic nomenclature and classification used in all manuscripts submitted for publication and prepares data on them for consideration by the committee. During the year 175 manuscripts, comprising 19,425 pages and involving about 3,643 geologic names, have been examined.

To meet the needs of the Survey geologists, as well as a strong demand from professional geologists in general, the work of compiling correlation charts and a stratigraphic lexicon of geologic formations in the United States and Alaska, in form for publication as bulletins, has been begun. The committee has invited the advice and cooperation of over 200 American geologists in the consideration of general questions relating to the revision of the classification and the nomenclature of North American geologic formations.

GENERAL SUMMARY.

Geologic investigations were continued in 47 States by a force of 164 geologists. Systematic detailed surveys of mining districts were carried on in Arizona, Colorado, Minnesota, Nevada, New Mexico, Oklahoma, Oregon, and Utah. Reconnaissance studies of mining districts were made in Arizona, California, Colorado, Idaho, Kentucky, Montana, Nevada, New Mexico, North Carolina, Oregon, Tennessee, Utah, and Wyoming, and general and detailed geologic and paleontologic work was continued in all parts of the country, including a large amount of geologic work in the coal and oil fields, especially in the public-land States, where also the search for commercial deposits of potash and nitrates was continued. Cooperative geologic work was carried on with the State geological surveys of 17 States, also with the Bureau of Mines, Bureau of Standards, Office of Public Roads, Bureau of Fisheries, Forest Service, Smithsonian Institution, Lighthouse Service, Geophysical Laboratory of the Carnegie Institution and the marine biologic station at Dry Tortugas.

Among the geologic investigations not relating to any particular region mention may be made (1) of the extension of the studies of sulphide enrichment, by W. H. Emmons, who has submitted a revised and greatly enlarged text replacing Bulletin 529 on this subject; and (2) of the investigation by David White into the origin of coal and petroleum and the development of the different classes of these fuels. The origin and the conditions of occurrence of oils of successively higher grades, and some conditions precluding the occurrence of oils in different regions are discussed in an address by Mr. White before the Washington Academy of Sciences and printed in the Journal of the Academy for March 19. A general paper on the origin of coal, prepared by Mr. White several years ago for

publication by the Bureau of Mines, has been printed in Bulletin 38 of that bureau.

WORK OF THE DIVISION BY STATES AND COUNTRIES.

The work of the division of geology during the year was done in 47 States, the Canal Zone, the Antilles, and the Hawaiian Islands.

ALABAMA.

The upper Eocene and Oligocene formations of Alabama have been thoroughly studied by C. Wythe Cooke, whose stratigraphic correlations have been transmitted for publication by the Survey as Professional Paper 95–I, "The age of the Ocala limestone." Mr. Cooke has in preparation also a preliminary account of the stratigraphy of the St. Stephens limestone.

Two manuscripts, one on the Catahoula formation and the other on the Pliocene of the Gulf Coastal Plain, have been submitted by G. C. Matson and E. W. Berry, Mr. Matson writing the stratigraphic descriptions and Mr. Berry the paleontologic descriptions and correlations, based on the study of the fossil plants. Mr. Berry has in preparation also a report on the fossil flora of the Claiborne group.

For the better definition and correlation of several of the formations to be described and mapped in the Bessemer-Vandiver and Montevallo-Columbiana folios, additional field examinations were made by Charles Butts, partly in conference with E. O. Ulrich, in the vicinity of Pelham and in the Shades Valley southeast of Bessemer. Paleontologic data for correlations in other regions of the State were collected by R. D. Mesler from the earlier Paleozoic formations.

In accordance with an informal cooperative agreement between the State geologists of a number of the Mississippi Valley States and the Federal Survey for the purpose of better differentiating the Mississippian formations and establishing correlations between different regions of the Mississippi, Ohio, Tennessee, and Appalachian valleys, the Carboniferous rocks of the Mississippian section near Huntsville were studied by G. H. Girty, with the object of collecting invertebrate fossils and making correlations.

The mica deposits in Randolph, Clay, Tallapoosa, and Coosa counties were examined by D. B. Sterrett, who has nearly completed the field work for a report on mica in Alabama.

A little field work was done on the red iron ores of northeastern Alabama by E. F. Burchard.

ARIZONA.

The quicksilver deposits of the Mazatzal Mountains, covering an area of about 20 square miles, were examined by F. L. Ransome, who submitted a brief report thereon (Bulletin 620–F). Mr. Ransome

also made a geologic reconnaissance of the Sierra Ancha and paid short visits to the Ray and Miami mining districts for the purpose of collecting supplementary specimens and data for his economic report on these districts. A brief paper on the Paleozoic section in the Ray quadrangle was published by Mr. Ransome in an unofficial periodical.

A report on the mineral deposits of the Santa Rita and Patagonia Mountains by F. C. Schrader was published as Bulletin 582.

A detailed examination of the Colorado River and Yuma Indian reservations, primarily for purposes of classification, was made at the request of the Office of Indian Affairs. Some of the results of this work, which was done by E. L. Jones, jr., were embodied in a paper on the placer deposits near Quartzsite (Bulletin 620–C). Mr. Jones also prepared a brief report on a reconnaissance covering perhaps 60 square miles in the Kofa Mountains (Bulletin 620–H) and has in preparation a short report on the Dos Cabezas mining district, the field work for which was done during the previous season. A preliminary draft of the Tucson folio, on which C. F. Tolman, jr., has been engaged, was submitted by him, but further field work is necessary before the text and maps will be ready for publication.

A report on the Shinumo quadrangle, in the Grand Canyon district, by L. F. Noble, appeared as Bulletin 549. Further studies of Grand Canyon geology are being prosecuted by Mr. Noble, chiefly at his own expense.

The detailed areal and economic survey of the geology of the Winkelman quadrangle has been begun by C. H. Clapp, who has mapped 173 square miles.

A reconnaissance report on northeastern Arizona and northwestern New Mexico, based on several years of field examinations by H. E. Gregory, has been nearly completed. Field work in this region is now in progress.

In connection with the preparation of the guidebook to the region along the Santa Fe Route, from Kansas City to Los Angeles, field examinations were made at a number of points in Arizona.

At the request of the Department of Agriculture an examination of some mining claims in the Grand Canyon was made by H. G. Ferguson, whose preliminary report has been transmitted to the Secretary of the Interior.

ARKANSAS.

A study of the recent geologic history in the vicinity of Moon Lake for the Department of Justice, by E. W. Shaw, has resulted in interesting observations on the processes and effects of erosion and sedimentation, which will be incorporated in Mr. Shaw's report on the Mississippi embayment.

The fossil floras of the Jackson and Claiborne groups in Arkansas are now being studied by E. W. Berry. The results of this work

will be important not only in correlations between other areas and Arkansas but in contributing to knowledge of the extinct floras of the earlier Tertiary in southern North America.

Short examinations, necessary for the correlation of the formations of the Hot Springs, Caddo Gap, and DeQueen quadrangles, were made by H. D. Miser. The Hot Springs folio is well advanced toward completion and the manuscript for the Caddo Gap-DeQueen folio is progressing satisfactorily.

A folio covering the Harrison and Eureka Springs quadrangles was completed by H. D. Miser and A. H. Purdue and has been submitted for publication.

The gypsum deposits of Arkansas have been described by Mr. Miser for publication in the revised edition of Bulletin 223. Mr. Miser also furnished the Arkansas data for use in the revision of Bulletin 585, "Useful minerals of the United States."

Water-Supply Paper 399, "Geology and underground waters of northeastern Arkansas," by L. W. Stephenson and A. F. Crider, with a discussion of the chemical character of the water by R. B. Dole, has been revised and is now in the hands of the editor.

The asphalt deposits near Mena were examined by C. H. Wegemann. These deposits are interesting mainly because of the advanced carbonization of the hydrocarbon substance, which appears to have suffered alteration.

The Carboniferous faunas of Arkansas have been described by G. H. Girty in Bulletins 593, 595, and 598, in press at the close of the fiscal year.

CALIFORNIA.

A review of the deposits of salt, soda, borax, and potash at Searles Lake, San Bernardino County, was made by H. S. Gale, and a report on these deposits was issued as Bulletin 580–L. A brief report on the Amargosa nitrate area, in Inyo County, by Mr. Gale, was transmitted to the War Department, at whose request the examination was made.

Studies of the petroleum resources of the State were continued by R. W. Pack, G. S. Rogers, and W. A. English, and the investigation of the Sunset-Midway field was completed, special attention being given to the underground conditions as revealed by the drill records, in order to discover, if possible, the laws governing the accumulation of oil and gas and particularly the relation of productive pools to geologic structure and to water. A detailed resurvey, including about 300 square miles, was made of the areal geology in this field and the surrounding areas, the description of which, mainly by Mr. Pack, is now in preparation. Special attention was given by Mr. Rogers to the conditions of water movement and invasion. In prosecuting this

work he made a close study of the geologic structure and of the history and behavior of the wells. In the determination of local structure, as well as in the consideration of the water problem, Mr. Rogers contributed to the investigation of the general geology of the region.

Ralph Arnold, formerly of this Survey, assisted by J. R. Pemberton, spent 10 days in field revision of the geologic map of the Ventura quadrangle.

A detailed examination of the stratigraphy and structure of undrilled areas in Cuyama Valley, aggregating about 400 square miles, was made by W. A. English, under the general supervision of R. W. Pack, in order to determine their probable oil prospects. A report on these areas has been prepared and submitted for publication.

A report by Robert Anderson and R. W. Pack, on the geology and oil prospects along the western border of the San Joaquin Valley north of Coalinga, is now in press as Bulletin 603.

Studies in Yosemite National Park were continued by F. E. Matthes and F. C. Calkins. Mr. Calkins mapped in detail the igneous rocks of part of the tract represented by the special map of the Yosemite Valley. Mr. Matthes continued and nearly completed the physiographic study, including the detailed mapping of the moraines, of the upper Merced basin and of some adjacent ground. Messrs. Matthes and Calkins are collaborating in a popular account of the geology of the Yosemite region, which is designed primarily to give a comprehensive and scientifically exact yet readable explanation of the sculpture of the region but deals with all aspects of the geology. Mr. Matthes writes of the general geologic history and the work of streams and glaciers, and Mr. Calkins contributes an account of the hard rocks, whose distribution greatly influences the character of the sculpture.

The results of the detailed study of the Weaverville quadrangle are in preparation by J. S. Diller and H. G. Ferguson for issue in a folio.

A report on the lode deposits of the Allegheny district by Mr. Ferguson was published as Bulletin 580–I and a paper on the pocket gold deposits of the Klamath Mountains, also by Mr. Ferguson, was prepared for unofficial publication.

Lassen Peak, which was visited in June, 1914, and again in the autumn of that year by Mr. Diller while he was gathering data for the guidebook covering the Shasta Route and Coast Line (Bulletin 614) was revisited by him in June, 1915, for the purpose of studying the phenomena of the only active volcano in the United States (exclusive of Alaska), with a view to the preparation of an educational bulletin describing and illustrating Lassen Peak, its history and present changes, and its volcanic action as a whole.

A report on the geology of the east slope of the Sierra Nevada overlooking Owens Valley has been practically completed by Adolph

Knopf, who in the summer of 1914 made a preliminary field examination of the Mother Lode district in preparation for a thorough study of that district during the season of 1915–16.

A report on some mining districts in northeastern California and northwestern Nevada (Bulletin 594), by J. M. Hill, was issued during the year.

A portion of the Rock Creek quadrangle was mapped in detail by L. F. Noble for folio publication.

An area lying between latitude 34° 30′ and the Mexican boundary has been covered by a reconnaissance examination by R. T. Hill, who, after mapping about 4,000 square miles on a scale of 1:250,000, is now preparing a report on this region.

The report on the copper deposits of Shasta County, by L. C. Graton, the preparation of which has long been postponed in consequence of Mr. Graton's resignation from the Survey, is now well advanced, though Mr. Graton expects to make additional field revision during the coming year before the report is submitted for publication.

COLORADO.

The survey of the volcanic area of the San Juan Mountains was continued by Whitman Cross, assisted by E. S. Larsen, jr., and J. Fred Hunter, jr., but in accordance with the plan adopted in 1913 to complete the study of the great volcanic complex of these mountains as speedily as possible, the work was all of reconnaissance character. Of the 1,020 square miles examined in the northeastern portion of the mountains, 650 square miles were covered in reconnaissance and 370 miles in semidetail. In the area south of Tomichi Creek and Marshall Pass and west of the San Luis Valley, in the Cochetopa and Saguache quadrangles, it was found impossible to maintain the standard of geologic mapping followed in other regions, on account of the inadequacy of the Hayden topographic map and other maps available for the delineation of geologic details. A greater measure of success was achieved in the Creede quadrangle, of which a new topographic map was available. A report covering the season's field work is in preparation by Messrs. Cross and Hunter, and Mr. Cross was also engaged on a general report on the geology of the entire San Juan area. A paper describing the pre-Cambrian rocks along Gunnison River was prepared by Mr. Hunter.

The Pleistocene deposits in the San Juan Mountains (Montrose quadrangle) were studied by W. W. Atwood, assisted by Kirtley Mather. A report by Mr. Atwood, describing an extremely interesting glacial deposit of Eocene age in southwestern Colorado, has recently been published as Professional Paper 95–B.

A detailed report on the economic geology of Gilpin County and adjacent portions of Clear Creek and Boulder counties, embracing the Central City district, by E. S. Bastin and J. M. Hill, has been transmitted for publication. A description of the ores of Gilpin County by Mr. Bastin and a paper by Mr. Bastin and Chase Palmer on the precipitative action of metallic minerals upon silver in solution have been printed in unofficial publications. Mr. Bastin also prepared a paper on the geology of the pitchblende ores of Colorado (Professional Paper 90–A).

A report on the Creede district by E. S. Larsen, jr., and W. H. Emmons is now nearing completion, that portion of the manuscript by Mr. Emmons having already been transmitted.

For the monograph on the Leadville district, in preparation by J. D. Irving, a chapter on the oxidized zinc ores has been submitted by G. F. Loughlin, and F. B. Laney is preparing a chapter on the microstructure of the ores.

Brief investigations of reported nitrate occurrences in Colorado were made by M. I. Goldman, who has reviewed in the office the somewhat voluminous literature on the subject of soil nitrates in Colorado and Utah with a view to submitting, for record and possible publication, his conclusions regarding the availability of certain soils as a commercial source of nitrates.

The description of the fossil flora of the Laramie formation in the Denver Basin is in progress by F. H. Knowlton, and a monograph covering this work and including a historical account of the Laramie problem is now nearly completed.

In northern Colorado, from Windsor and Greeley southward to Boulder, full collections representing the fauna of the Fox Hills sandstone were made by T. E. Williard and T. W. Stanton, and a preliminary study for a comparison of them with the typical Fox Hills fauna has been made by Mr. Stanton. A collection of fossil plants from the Fox Hills sandstone has been described by F. H. Knowlton.

The Ordovician section at Canon City has been reviewed by Edwin Kirk for purposes of correlation.

The detailed examination of the mineral resources of the Yampa coal field was continued in the office by E. T. Hancock, who has submitted for publication economic reports on the Meeker, Axial, and Monument Butte quadrangles. Folios covering these quadrangles are also in preparation by Mr. Hancock. A general report on the entire Yampa coal field was submitted by Mr. Hancock for inclusion in the forthcoming paper describing the coal fields of the United States. The history of a portion of Yampa River and its possible bearing on that of Green River by Mr. Hancock was published as Professional Paper 90–K. In response to numerous requests received by the Survey, further investigations of four sections of

land in the Yampa coal field for the purpose of land classification, were made by Mr. Hancock.

The investigation of the oil shale in the Green River formation in northwestern Colorado and eastern Utah, which was begun by E. G. Woodruff prior to his resignation from the Survey in 1913, was continued in greater detail by D. E. Winchester, assisted by H. M. Robinson, who made a reconnaissance examination of about 1,000 square miles. In the course of this work the oil shale beds were examined at a number of places in western Colorado, many sections were measured in detail, and numerous samples, cut from different parts of the beds, were collected and subjected to distillation tests in the field. Many samples were also shipped to Washington, where distillation tests were made in the laboratory of the Bureau of Mines by Mr. Winchester under the direction of David T. Day. The field distillation experiments were observed for a short time by Dr. Day, who, together with C. A. Davis, D. E. Winchester, and David White, revisited the De Beque region, where oil shale of unusual interest was discovered by Mr. Woodruff the previous year. Field surveys were resumed by Mr. Winchester in June, 1915, with the intention of extending the examination northward into Wyoming. A report covering the investigations of the year was completed by Mr. Winchester and submitted for publication as a chapter in Bulletin 621. In the course of brief field studies of the deposition of the oil shale at a number of points, C. A. Davis, in company with David White, collected samples of the shale and began a paleontologic investigation of its origin and composition. The oil shale was found to be composed in large part of plant remains of low orders, mainly algæ and fungi. A collection of the oil shales of Colorado, Utah, and other States, arranged by Mr. Winchester, is now on exhibition at the Panama-Pacific Exposition.

The detailed investigation of the areal and economic geology and the classification of the lands in the Red Mesa and Soda Canyon quadrangles, begun by M. A. Pishel, who resigned from the Survey in August, 1914, was continued by A. J. Collier, assisted by O. B. Hopkins. Together they surveyed 238 square miles, in which geologic mapping was done and coal outcrops were located by plane-table methods. The land has been classified, and an economic report and a folio are in preparation by Mr. Collier, who is also preparing a popular geologic guide to the Mesa Verde National Park. Mr. Collier also examined in detail the northern part of the plateau north of the Red Mesa quadrangle, in T. 35 N., Rs. 12 and 13 W., comprising an area of about 16 square miles, for the purpose of classifying and valuing the land. An economic report on this area was prepared for publication.

In the Trinidad field, near Cokedale, examinations were made by M. W. Ball for the purpose of classifying and valuing the coal lands, the report to be prepared at a later date.

In the vicinity of Austin, in Delta County, an area of about 10 square miles, including a structural dome, was hastily examined by M. R. Campbell, for the purpose of determining whether or not the geologic conditions are favorable for the occurrence of oil or gas. The conclusions, which were unfavorable, were issued in the form of a press notice for the benefit of those interested in the region. Mr. Campbell also examined a half section of coal land in the vicinity of Mattison, Elbert County, to collect data for its classification and valuation.

A report on the coal resources of North Park, by A. L. Beekly, has been published as Bulletin 596.

CONNECTICUT.

The feldspar quarries in Middlesex County, Conn., in which mica and the gem minerals tourmaline, beryl, and lepidolite are found, and the old mica, feldspar, and beryl mine near New Milford, in Litchfield County, were examined by D. B. Sterrett.

DELAWARE.

The manuscript and maps describing the areal and economic geology of the Elkton and Wilmington quadrangles, in Pennsylvania and Delaware, have been submitted by Miss Florence Bascom and B. L. Miller, for publication as a folio. The small gas emissions coming from a number of shallow-water wells near the State boundary in the region of Salisbury, Md., were investigated by G. C. Matson. (See Maryland, p. 490.)

FLORIDA.

The stratigraphic and paleontologic investigations of the upper Eocene and Oligocene formations of Florida were continued by C. Wythe Cooke, who made a special study, for correlation, of the Ocala limestone and prepared a paper on the age of that formation.

At Laurel Hill and River Junction field conferences were held by T. Wayland Vaughan with Mr. Cooke and W. C. Mansfield, and data were gathered by Mr. Cooke on the structure of the Apalachicola group by running lines of levels in both areas. The Eocene and Oligocene formations at Marianna and Chipley and the Miocene at Redbay were restudied. Mr. Cooke also made a study of the upper Oligocene and Miocene formations on Apalachicola River between River Junction and Blountstown and on Chipola River. A report on the fossil mollusks of Chipola Oak Grove and Shoal River is in preparation by Miss Julia Gardner, and two reports on the Miocene

and Pliocene foraminifers of the Coastal Plain, including Florida, by Joseph A. Cushman, have been transmitted for publication.

Investigations of the Florida Keys region were continued by T. Wayland Vaughan, who prepared and published several scientific papers on the geology and recent deposits of this part of the coast.

A report on the phosphate deposits of Florida (Bulletin 604) by G. C. Matson, is in press and "A monograph of the molluscan fauna of the *Orthaulax pugnax* zone of the Oligocene of Tampa, Fla.," by William H. Dall, was published by the United States National Museum.

GEORGIA.

In continuance of the studies of the stratigraphy and paleontology of the upper Eocene and Oligocene formations in Georgia the Ocala and Chattahoochee formations at Bainbridge and vicinity were examined by C. Wythe Cooke, assisted by W. C. Mansfield. Instrumental level lines were run over the principal sections. The correlative results of the study are contained in the paper by Mr. Cooke on the age of the Ocala limestone already mentioned. A fauna at the base of the Chattahoochee formation, because of its wide geographic distribution in the Greater and Lesser Antilles, is being described by W. H. Dall.

A report of the fossil flora of the Claiborne group is in preparation by E. W. Berry.

The paper on "Underground water resources of the Coastal Plain of Georgia" (Water-Supply Paper 341), by L. W. Stephenson and J. O. Veatch, was published during the year.

Mica prospects in Hall and Cherokee counties were examined by D. B. Sterrett.

New openings on the red iron ore beds in Walker County were examined by E. F. Burchard.

IDAHO.

Studies which are to result in a comprehensive summary report on the ore deposits of Idaho, by J. B. Umpleby, were continued during the year. No field work was done, but a large amount of material previously collected was elaborated and prepared for publication. A report on the Mackay region, which embraces the drainage areas of Little and Big Lost rivers and Birch Creek, was transmitted by Mr. Umpleby for publication as a professional paper. He also finished a short paper on the ore deposits of the Sawtooth quadrangle (Bulletin 580–K) and has completed the description of the ore deposits in the Hailey quadrangle, the geology of which has been mapped for folio publication by L. G. Westgate, assisted by R. S. Knappen. Edwin Kirk, paleontologist, gave assistance in the solution of the stratigraphic problems of the area. In response to a

request from the Office of Indian Affairs, Mr. Umpleby examined and reported on leakages near the head of the Blackfoot Reservoir.

The gravels of the Fort Hall bottoms on Snake River were, at the request of the Office of Indian Affairs, investigated by J. M. Hill, who submitted a paper on gold in the Snake River gravels for publication (Bulletin 620–J).

The geologic mapping of the Wayan quadrangle, which includes the Crow Creek, Slug Creek, Lance Creek, and Freedom 15-minute quadrangles, was completed by G. R. Mansfield, assisted by E. L. Jones, jr., P. V. Roundy, and E. H. Finch. Progress has been made by Mr. Mansfield in the preparation of folios for the Wayan and Montpelier quadrangles, and a paper on the geology of the Fort Hall Reservation was prepared for unofficial publication by Mr. Mansfield, who, with E. S. Larsen, jr., is unofficially publishing a paper describing the occurrence of nepheline basalt in the Fort Hall Reservation. The Paleozoic and Triassic formations and faunas of the Wayan quadrangle were studied both in the field and in the office by G. H. Girty.

For the Henry district land-classification data were completed and transmitted, and a report on the economic geology of the district was begun by Mr. Mansfield, who has also submitted a manuscript on the geology and phosphate deposits of the Fort Hall Indian Reservation. A detailed examination for phosphate in part of the Crow Creek and Freedom quadrangles was made in order to classify the lands.

Reported deposits of nitrates in the vicinity of Homedale, Owyhee County, were examined by Mr. Mansfield, whose report "Nitrate deposits in southern Idaho," has been issued as Bulletin 620–B.

A report on a geologic reconnaissance in southeastern Idaho and western Wyoming, with special reference to phosphate deposits, was submitted by A. R. Schultz.

A report classifying the lands in the vicinity of Orofino Creek and Clearwater River, examined in 1913, was prepared by C. T. Lupton, who also submitted a manuscript for a paper on the Orofino coal field for publication (Bulletin 621–I).

A summary report on the coal fields of Idaho, based on work of previous years, was prepared by C. F. Bowen for publication in the paper dealing with the coal fields of the United States, which is being compiled under the direction of M. R. Campbell.

ILLINOIS.

Under the arrangement for cooperation with the Illinois Geological Survey, the areal geology and mineral resources of the Mount Olive and Gillespie quadrangles were mapped in detail by Wallace Lee, who prepared an economic report describing the coal resources, oil pros-

pects, and geologic structure for publication by the State geological survey, and who has brought a folio covering these quadrangles to an advanced stage. In the mapping of the glacial and associated deposits Mr. Lee conferred with W. C. Alden and E. W. Shaw. The investigation of the stratigraphy and the mapping of the areal geology in the Equality and Shawneetown quadrangles, also cooperative, was begun by Mr. Lee, and he examined portions of the Golconda and Fords Ferry quadrangles, on the Illinois side of Ohio River.

The glacial and associated deposits in the Edgington, Milan, Canton, Colchester, Macomb, Tallula, and Springfield quadrangles were briefly studied by W. C. Alden for comparison with similar deposits in Iowa.

The dark shale and bony coal overlying the Springfield (No. 5) coal bed were examined by G. H. Ashley for the purpose of collecting material to be subjected to distillation experiments.

The Pleistocene formations and physiography of the Baldwin, Chester, Renault, Kimmswick, and Crystal City quadrangles were further studied by E. W. Shaw with a view to their description in cooperative folios.

Folios for the Carlyle, Centralia, New Athens, and Okawville quadrangles were nearly completed by Mr. Shaw, the greater part of whose time was devoted to studies of Pleistocene deposits and sedimentation in the Gulf region of the Coastal Plain.

INDIANA.

A report on "The Pleistocene of Indiana and Michigan and the history of the Great Lakes," by Frank Leverett and F. B. Taylor, was published as Monograph 53.

In connection with the discussion and correlation of the formations in the vicinity of Cincinnati, Ohio, the Paleozoic formations and faunas in southeastern Indiana were studied by E. O. Ulrich.

Field examinations of the Devonian black shales in the New Albany region and of the dark shales and bony layers associated with some of the coal beds of the State were made by G. H. Ashley, who collected samples for laboratory distillation in order to determine their value as sources of petroleum distillates and their by-products.

IOWA.

A review of the evidence of an Iowan stage of glaciation and of its relations to the deposits of other Pleistocene stages in eastern Iowa and adjoining States occupied W. C. Alden during the greater part of the field season of 1914. This work was done in cooperation with the Iowa State Geological Survey, which furnished an assistant, Morris M. Leighton, for the season. The studies were resumed in June, 1915.

A short field conference on the mapping of the Quaternary deposits of northwestern Iowa was held between E. S. Carman, of the State Geological Survey, and Frank Leverett.

A short report containing a summary description of the coal fields and coals of Iowa was prepared by Henry Hinds for incorporation in the general report by M. R. Campbell on the coal fields of the United States.

The stratigraphy of the Mississippian formations in southeastern Iowa was examined and collections of fossils were made by F. M. Van Tuyl, of the State Geological Survey, the paleontologic supervision of the investigation being, through informal cooperation, in charge of Stuart Weller, who has conducted similar investigations for the Federal Survey in Missouri, Illinois, and western Kentucky.

KANSAS.

The description of the ore deposits of the Joplin district, Missouri, and of the Miami district, Oklahoma, with field studies extending into southeastern Kansas, was continued by C. E. Siebenthal, whose report on the origin of the zinc and lead deposits of the Joplin region (Bulletin 606) is now in press.

The Leavenworth-Smithville folio, by Henry Hinds and F. C. Greene, has been revised by Mr. Hinds.

KENTUCKY.

A detailed survey of the areal geology and mineral resources of Jefferson County, Ky., was completed by Charles Butts, assisted by T. C. Brown and J. J. Galloway. This survey was made in cooperation with the Kentucky Geological Survey, to which the report, now nearing completion, will be submitted for publication. Several quadrangles, including the Louisville and Kosmosdale, lie wholly or in part within Jefferson County, and it is planned that folios shall be prepared after certain problems have received further field consideration and after small areas lying outside of the county have been mapped.

Field studies in the stratigraphy and paleontology of the early Paleozoic formations of central Kentucky and in the Louisville quadrangle were made by E. O. Ulrich.

Several Carboniferous sections in southeastern Kentucky were examined for purposes of correlation by G. H. Girty.

The phosphate deposits in Woodford and adjoining counties have been examined partly in reconnaissance and partly in detail by W. C. Phalen, who explored portions of this relatively little known phosphate field by means of shallow drilling. A large number of samples were collected for chemical analysis. The results of these investigations are designed to be incorporated in a report on the phosphate deposits of the southern Appalachian region.

A study of the physiography and the Quaternary geology of the western part of the State, by E. W. Shaw, is in progress as a part of an investigation covering the late Pleistocene geologic history of the Mississippi embayment.

Professional Paper 91, "The lower Eocene floras of southeastern North America," by E. W. Berry, including areas in Kentucky, is in press.

LOUISIANA.

With the object of guiding exploration in the discovery and the development of oil pools in Louisiana, preliminary reconnaissance examinations of the geologic structure with special reference to the presence of oil and gas were made by G. C. Matson, assisted by O. B. Hopkins and E. H. Finch, in a number of districts, most attention, however, being given to Bossier, De Soto, Caddo, and Red River parishes. Reports covering this work are now in preparation. At the request of the General Land Office an examination of the islands in Sabine River near Orange, Tex., was made by Mr. Hopkins for the purpose of land classification.

A report on the iron-bearing deposits in Bossier, Caddo, and Webster parishes, by E. F. Burchard, the field work for which was done in the fall of 1914, is ready for publication as Bulletin 620–G.

The upper Tertiary formations in southwestern Louisiana were examined by G. C. Matson and Alexander Deussen, and fossil plants and invertebrates from several localities and formations have been studied by E. W. Berry and C. Wythe Cooke. Reports now in preparation include a study of the floras of the Claiborne and Jackson groups by Mr. Berry and a general report on the physiography and surficial geology of the Gulf embayment by E. W. Shaw. A manuscript by Mr. Matson on the Pliocene of the eastern and central Gulf Coastal Plain and two manuscripts on the Catahoula formation, the stratigraphy being described by Mr. Matson and the fossil plants by Mr. Berry, were transmitted for publication.

Supplementary investigations of the stratigraphy, paleontology, and ground waters of the Cretaceous deposits of northeastern Louisiana were made by L. W. Stephenson.

Professional Paper 91, "The lower Eocene floras of southeastern North America," by E. W. Berry, is in press, and Bulletin 619, "The Caddo oil and gas field, Louisiana," by G. C. Matson, is in the hands of the editor.

MAINE.

Additional field examinations were made by Frank J. Katz in the Portland and Casco Bay quadrangles for the solution of problems which arose during the office preparation of a folio for these quadrangles. This review, during which Mr. Katz was joined by Arthur Keith for field conference and inspection, was not made in cooperation

with the State, though the greater part of the previous work on these quadrangles was done in cooperation. The text and maps for this folio are nearing completion.

The areal survey of the Dover and York quadrangles was commenced by Mr. Katz, who has covered about 50 square miles, and progress was made on the maps and collections in the office.

In the Boothbay quadrangle a brief reconnaissance covering about 20 square miles was made by Mr. Keith.

Professional Paper 89, "The fauna of the Chapman sandstone," by H. S. Williams, has been revised by the author and a chapter on the Ostracoda of the formation has been added by E. O. Ulrich. This paper is now in press.

MARYLAND.

The mapping of the Williamsport quadrangle, which includes portions of West Virginia and Pennsylvania, was completed by George W. Stose, who covered about 100 square miles in detail. The descriptions and maps for this quadrangle, which with the Hagerstown quadrangle will be covered by a single folio, are well advanced toward completion. This folio was provided for under cooperation with the Maryland Geological Survey. Conferences for deciding certain questions of stratigraphy and correlation were held by Mr. Stose, E. O. Ulrich, and R. S. Bassler in the Hagerstown and Frederick quadrangles.

The folio for the Elkton and Wilmington quadrangles, including parts of Pennsylvania and Delaware, was transmitted for publication. This folio was prepared by Miss Florence Bascom and B. L. Miller, in cooperation with the Geological Survey of Maryland.

The Tolchester folio, by B. L. Miller, E. B. Mathews, Arthur B. Bibbins, and Homer P. Little, also cooperative, was completed and transmitted for publication.

At the request of the Committee on Public Buildings of the House of Representatives a marble quarry near Union Bridge, Carroll County, was examined by T. N. Dale, in association with Oliver Bowles, quarry technologist of the Bureau of Mines. A short report on the rocks examined was transmitted to the committee.

In order to ascertain whether the small emissions of gas proceeding from a number of shallow wells driven for water in the region of Salisbury, Md., were of deep-seated (rock) origin, and if so whether they might be regarded as indications of possible gas or oil pools in the region, an examination was made by G. C. Matson. The results of this investigation were not sufficiently encouraging to merit formal publication.

For the more accurate differentiation and discrimination of the Pleistocene formations of the Maryland portion of the Coastal Plain

an inspection of the terraces of peninsular Maryland was made by T. Wayland Vaughan, E. W. Berry, and P. S. Smith, in conference with W. B. Clark, director of the State Geological Survey.

MASSACHUSETTS.

Reviews necessary to the completion of the descriptions of the Boston and Boston Bay quadrangles were made by Laurence La Forge. The preparation of the Boston folio, which is to cover these quadrangles, is now well advanced. Reconnaissance examinations were made by Mr. La Forge in the Haverhill, Lowell, Lawrence, Newburyport, and Salem quadrangles. A field conference was held in the Framingham quadrangle by Mr. La Forge and Arthur Keith, who inspected the geologic mapping.

The areal and economic survey of the Greylock quadrangle was continued by L. M. Prindle, who conferred with Mr. Keith in the field.

The Sheffield-Sandisfield folio was the subject of an office conference between Arthur Keith, Joseph Barrell, and B. K. Emerson. Mr. Keith also conferred with Mr. Emerson regarding the Pittsfield and Becket geologic work and certain features of Mr. Emerson's report on the geology of Massachusetts (Bulletin 597).

Manuscript maps and geologic descriptions for the Worcester-Marlboro, Palmer-Brookfield, Webster-Blackstone, and Belchertown-Barre folios have been submitted by Mr. Emerson, and his office work on the Warwick-Winchendon folio has been continued to an advanced stage.

Field studies of the geology of Cape Cod, Nantucket, Marthas Vineyard, and the Elizabeth Islands were begun in June by J. B. Woodworth, with the object of mapping and preparing a report on the geology of this portion of the Atlantic Coastal Plain.

The field examination of the Quaternary geology of the Berlin and Greylock quadrangles, in New York and Massachusetts, was completed by F. B. Taylor, who has prepared a manuscript describing the surficial deposits for folio publication.

Deposits containing tourmaline, beryl, and lithia minerals in the vicinity of West Chesterfield and Goshen, Hampshire County, were examined by D. B. Sterrett.

MICHIGAN.

The report on "The Pleistocene of Indiana and Michigan and the history of the Great Lakes," by Frank Leverett and F. B. Taylor, has been published as Monograph 53, and a special report on the extent and relations of the Superior ice lobe in Michigan, Wisconsin, and Minnesota is in preparation by Mr. Leverett.

In accordance with an informal arrangement for cooperation with the Michigan Geological Survey in paleontologic investigations, the Marshall fauna of the State has been studied by G. H. Girty.

MINNESOTA.

The work of mapping the glacial deposits of Minnesota, with special reference to the origin of the soils, was continued by Frank Leverett, assisted by F. W. Sardeson, of the State Geological Survey. A report entitled "Surface formations and agricultural conditions of northwestern Minnesota," by Frank Leverett, with a chapter on the climatic conditions of Minnesota, by U. G. Pursell, was transmitted to the State and published as Bulletin 12 of the Minnesota Geological Survey. This is the first of a series of papers to be based on this work. Manuscript for a report on the soils and surface deposits of northeastern Minnesota has been prepared by Mr. Leverett for publication by the State, and he has done considerable work, with the assistance of Mr. Sardeson, on a general report on the Quaternary deposits and history of Minnesota, to be published by the Federal Survey.

A brief reconnaissance study of the pre-Wisconsin Quaternary deposits in some of the southeastern counties of the State was made by W. C. Alden, for comparison with similar deposits in Iowa. Field conferences regarding the mapping and classification of these deposits were held between Messrs. Leverett, Sardeson, and Alden and between T. C. Chamberlin and Mr. Leverett.

Cooperative studies preliminary to a general report on the stratigraphy and economic geology of the Cuyuna iron range were made by E. C. Harder, of this Survey, and A. W. Johnstown, of the State Survey. A preliminary paper on the bacterial deposition of iron ores has been prepared by Mr. Harder for publication in "Shorter contributions to general geology." Under cooperative agreement also studies of the magnetite ores of the State were begun by F. F. Grout, of the Minnesota Survey, and H. H. Brodt.

As products of previous cooperative work conducted with the State Geological Survey a report on the clays and shales of Minnesota, by F. F. Grout, and a similar report on the building stones of the State, by Oliver C. Bowles, were completed and submitted for publication in bulletin form.

MISSISSIPPI.

Structural studies for the purpose of finding geologic conditions favorable to the occurrence of oil or gas in the Vicksburg quadrangle, Miss., were carried on by G. C. Matson, O. B. Hopkins, and E. H. Finch. A report containing the results of this investigation is now in preparation. Brief examinations were also made by Mr. Matson at Hattiesburg, Natchez, and Seminary.

Reports on the geology of the Coastal Plain of Mississippi and on the ground waters of the State are in preparation. The investigations have been carried on in cooperation with the State Geological Survey of Mississippi, field work being done by five geologists of the Federal Survey and E. N. Lowe, State geologist.

The examinations of the upper Eocene and Oligocene formations in the State were continued by C. Wythe Cooke, who has transmitted a paper entitled "The age of the Ocala limestone" (Professional Paper 95–I). This report will be of special value for correlation.

A report on the physiography, surficial deposits, and Pleistocene geologic history of the Gulf embayment, which is in preparation by Mr. Shaw, will embrace the State of Mississippi. In connection with this investigation Mr. Shaw is making a special study of the silts of the Mississippi Valley.

Additional field studies of the post-Eocene geologic formations were made by G. C. Matson, who cooperated with Mr. Shaw in a part of the investigations of the latest Tertiary and Pleistocene formations.

A report on the fossil flora of the Claiborne group, which is exposed in Mississippi, is in preparation by E. W. Berry. Reports covering the results of earlier field and office investigations submitted during the year include a manuscript on the Pliocene of the eastern and central Gulf Coastal Plain by G. C. Matson; two manuscripts on the Catahoula formation, one on the stratigraphy by Mr. Matson and one on the fossil plants by Mr. Berry; and a manuscript entitled "Erosion intervals in the Eocene of the Mississippi embayment," by Mr. Berry (Professional Paper 95–F).

Professional Paper 91, "The lower Eocene floras of southeastern North America," by E. W. Berry, is now in press.

MISSOURI.

A report by C. E. Siebenthal on the origin of the Joplin lead and zinc ores, now in press as Bulletin 606, contains conclusions based on a long and thorough investigation of the geology and ore deposits of the Joplin region.

In response to a request of the State geologist the earlier Paleozoic formations of eastern and central Missouri were briefly studied for purposes of classification and correlation by E. O. Ulrich. On the part of the State additional investigations, both paleontologic and stratigraphic, of the Mississippian formations, mainly in Ste. Genevieve County, were made by Stuart Weller.

Further field examinations of the Pleistocene deposits in the Crystal City and Renault quadrangles, for which geologic folios are in preparation in cooperation with the Missouri Bureau of Geology and Mines, were made by E. W. Shaw.

The Green City-Queen City folio text, by F. C. Greene, was critically revised by Henry Hinds, under whose supervision the field and office work relating to these quadrangles was done. Some revisory work was also done by Mr. Hinds on the Leavenworth-Smithville folio, the geologic maps for which are now engraved.

A chapter describing in summary form the coal fields of Missouri was prepared by Mr. Hinds for inclusion in the work by M. R. Campbell on the coal fields of the United States.

MONTANA.

A portion of the Judith River coal field in northeastern Chouteau and Fergus counties, Mont., embracing about 600 square miles, was geologically surveyed in a detailed reconnaissance examination by E. R. Lloyd, assisted by W. T. Thom, jr., and W. B. Wilson. The lands of this area have been classified and an economic report has been prepared, but the publication of this report will be delayed to incorporate the results of additional field work. A paleontologic study of the Cretaceous and Eocene formations of this region was made by T. W. Stanton for purposes of correlation.

A report on the subbituminous coal and lignite regions of eastern Montana is in preparation by E. R. Lloyd for publication in the forthcoming paper on the coal fields of the United States. The completion of Mr. Lloyd's manuscript is somewhat retarded on account of his recent transfer from the geologic branch to the land-classification board, where he was made secretary of the coal board.

The geology and coal resources of northern Teton County will be described by Eugene Stebinger in Bulletin 621–K.

An area of about 1,300 square miles in the Porcupine dome, north of Forsyth, was examined in a reconnaissance way, for the purpose of land classification, by C. F. Bowen, assisted by C. A. Bonine. The possibilities of oil in the Porcupine dome have been described by Mr. Bowen in Bulletin 621–F. Mr. Bowen also submitted a report on the stratigraphy of the Montana group, with special reference to the stratigraphic position and age of the Judith River formation, which has been published as Professional Paper 90–I.

A description, with maps, of the Tullock Creek coal field, which was examined in 1912–13, was completed and submitted for publication by G. S. Rogers, and a report on the Bull Mountain coal field, by R. W. Richards and C. T. Lupton, has been submitted.

A small area of lignite land near Glendive was examined for the purpose of classification by C. E. Lesher.

The areal mapping of the coal fields of southeastern Montana, which was begun in 1913, was continued by C. M. Bauer, with the assistance of E. M. Parks and R. W. Brown. This work was done primarily for purposes of land classification, but the areal geology

was also studied and mapped. Mr. Bauer examined about 800 square miles in more or less detail, and 1,500 square miles, mainly outside of the coal field, in a rapid reconnaissance. An economic report on the Ekalaka and Long Pine Hills coal field of southeastern Montana, studied in 1913–14, is now in preparation by Mr. Bauer.

An examination of the northeast corner of this State, north of the Fort Peck Indian Reservation, was begun by A. J. Collier, assisted by W. T. Thom, jr., for the purpose of classifying the land. An investigation of the Milk River valley was undertaken by Eugene Stebinger, assisted by W. P. Woodring and J. D. Sears.

The paleontology and stratigraphy of the formations on the north side of Yellowstone River, west and north of Forsyth, were studied by T. W. Stanton, who, in cooperation with C. W. Gilmore and the field party in charge of E. R. Lloyd, also made a careful review of the type area of the Judith River formation on the Missouri near the mouth of the Judith.

The placer deposits at Ruby and Virginia City were visited by J. M. Hill in connection with his general investigation, cooperative with the Bureau of Mines, of the placer deposits of the United States.

In the Browning and Chief Mountain quadrangles, in the Glacier National Park, areal geologic mapping was continued by Eugene Stebinger, with the assistance of C. S. Corbett and H. R. Bennett, about 725 square miles being mapped in detail on the 1:125,000 scale. Progress in the preparation of a report for the area has been made by Mr. Stebinger, who also prepared text, maps, and illustrations for the Blackfoot-Cutbank folio, the areal mapping of which was completed during the previous field season.

Final revision of the text of the Philipsburg folio was completed by F. C. Calkins.

NEVADA.

In the search for potash, under the supervision of H. S. Gale, boring was continued to a depth of 1,500 feet in the Black Rock Desert, Nev., when the coming of winter terminated the work. The drill crew was superintended by D. H. Walker, to whose skill and efficiency are due the economy and speed of the work and the completeness of the data gathered. Samples of the drillings were collected by M. I. Goldman and A. T. Crandall, and these are now undergoing analytical study by Mr. Goldman. Through the courtesy of the Department of Agriculture the diatoms have been examined by Dr. Albert Mann, specialist in the Diatomaceæ. A number of reported discoveries of potash salts or nitrates within the State were investigated by Mr. Gale, and analyses of submitted samples of salts were made in the chemical laboratory. No bed of potash salts was discovered in the deep well. The reported deposits proved on examination to

be either too low in potash or nitrates or too small to be of commercial importance.

In the spring of 1915 a new drilling equipment designed especially for the work and region was purchased, and surveys were made in the Smoke Creek Desert by Mr. Gale to determine localities that would appear relatively favorable for testing. Preparations were completed by Mr. Walker to resume drilling in that desert with the new rig early in July.

Nitrate-bearing beds north and northwest of the Black Rock Desert were examined by M. I. Goldman.

The Yerington district was studied in detail by Adolph Knopf and E. L. Jones, jr., who mapped 58 square miles on the scale of 1: 24,000. The results of this survey are now being prepared for publication. The cinnabar deposits east of Beatty and Mina were examined by Mr. Knopf, the results of whose investigations have been submitted for publication under the title, "Some cinnabar deposits in western Nevada" (Bulletin 620–D). The platinum deposits in the Yellow Pine district, Clark County, were investigated by Mr. Knopf, whose report, "A gold-platinum-palladium lode in southern Nevada," has appeared as Bulletin 620–A. A paper entitled, "Plumbojarosite and other basic lead-ferric sulphates from the Yellow Pine district, Nevada," was prepared by Mr. Knopf for unofficial publication.

The Rochester mining district is described by F. C. Schrader in Bulletin 580–M, issued during the year, and a report on "Some mining districts in northeastern California and northwestern Nevada" (Bulletin 594), by J. M. Hill, was also published.

A reconnaissance report on some mining districts in eastern Nevada, mostly in Elko, White Pine, Lincoln, and Clark counties, and on the Ravenswood district, in Lander County, has been submitted for publication by Mr. Hill.

The economic geology of the National district is described by Waldemar Lindgren in Bulletin 601, recently issued; and a detailed report on the geology and ore deposits of the Ely district, by A. C. Spencer, is in the editor's hands. In the preparation of the Ely report Sidney Paige collaborated in the office with Mr. Spencer.

The oxidized zinc ores near Eureka were investigated by G. F. Loughlin, the mining districts of the Carson Sink quadrangle are being described by F. C. Schrader, and an examination of the geology and ore deposits of the Manhattan district was begun by H. G. Ferguson.

A short paper on the occurrence of wurtzite at Goldfield was unofficially published by F. L. Ransome.

The silver ores of the Tonopah district are under investigation by metallographic methods, with reference to their association and origin, by E. S. Bastin, in collaboration with F. B. Laney.

NEW HAMPSHIRE.

Mica deposits, locally with gem beryl as an associated mineral, were examined in eleven townships in Grafton, Cheshire, and Stratford counties, N. H., by D. B. Sterrett, who nearly completed the field investigation of the principal deposits, preliminary to a description of the occurrence of mica in New Hampshire. The gem deposits will be described in a report on the occurrence of precious stones in the United States now in preparation.

The areal survey of the Dover and York quadrangles, including portions of Maine, was begun by F. J. Katz, who has also begun the office compilation of the field data.

The examination of the Peterboro quadrangle was continued during a portion of the field season by B. K. Emerson, who for a time was joined in a field reconnaissance by Arthur Keith. A brief reconnaissance was made in the Keene quadrangle by Mr. Keith. Portions of the Lowell, Lawrence, and Newburyport quadrangles, lying partly in Massachusetts, were examined by Laurence La Forge.

NEW JERSEY.

The areal survey of the Easton quadrangle, in New Jersey and Pennsylvania, was completed by H. B. Kümmel, the work being carried on in cooperation with the New Jersey Geological Survey. The manuscript and maps for this quadrangle will form part of the Allentown-Easton folio and are well advanced toward completion.

In accordance with the plan of the Survey to print on the backs of topographic maps that cover large centers of population or points of unusual scenic interest popular and instructive descriptions of the geography and of the origin of the physical features, a description of this sort was prepared by G. W. Stose for the Delaware Water Gap sheet. This description is based on field work done in the quadrangle, which lies largely in Pennsylvania, by W. S. Bayley and H. B. Kümmel, and on Mr. Stose's personal knowledge of the region. The general geologic data now available as to the quadrangle will probably be amplified when the study of the adjoining Wind Gap quadrangle has been made in order that both quadrangles may be covered in a single folio.

NEW MEXICO.

In connection with the general search for deposits of potash and nitrate salts, the investigation of the depositional basins in the "Red Beds" region of New Mexico was continued by N. H. Darton, whose principal object was to discover the centers of greatest evaporation of saline waters in the past.

The chief study of metalliferous areas undertaken in New Mexico during the year was that of the copper deposits at Santa Rita (Chino district), to which A. C. Spencer was assigned. With Mr. Spencer

were associated Sidney Paige, who studied the structure and superposed the geology on the Santa Rita special map; D. F. MacDonald, who examined the mining methods, especially the open-pit mining; and J. F. Hunter, jr., who assisted in the areal geologic mapping. Toward the close of the field season the district was visited by F. L. Ransome for the discussion of problems with Mr. Spencer.

The studies of mining methods by Mr. MacDonald were carried on in connection with the general investigation of the application of geologic features to the problems of mining and engineering construction, prosecuted in cooperation with the Bureau of Mines.

A study of the zinc ores of the Magdalena district was begun by G. F. Loughlin.

The geology and water resources of Luna County are described by N. H. Darton in Water-Supply Paper 345–C, recently issued.

A study of the geology and coal resources of the Raton and Brilliant quadrangles, in the Raton coal field, Colfax County, was completed by W. T. Lee, and an economic report covering the area has been submitted for publication. A folio by Mr. Lee describing in detail the geology of the quadrangles is in preparation.

The Datil Mountain region was revisited by D. E. Winchester for the purpose of collecting additional information regarding the stratigraphy and correlation of certain coal beds. Field work is now completed in the Datil Mountain region and in the Zuni Indian Reservation, and an economic report on these areas is in preparation by Mr. Winchester.

At the request of the Office of Indian Affairs, lands coming under the Hogback canal in the Navajo Indian Reservation were examined in 1913 by M. A. Pishel. A report on the area was submitted by Mr. Pishel prior to his resignation from the Survey to accept a more remunerative position in one of the large oil companies operating in the Southwest.

A detailed examination, for the General Land Office, of lands near Gallup, McKinley County, was made by C. T. Lupton, who is now preparing a geologic report on the area.

An extended and elaborate study of the San Juan coal basin, in the northwest corner of the State, was begun by C. M. Bauer, assisted by J. B. Reeside, jr., the purpose being to obtain data for classifying the lands in the interior of this great basin and for determining the age and the correlation of the formations. The results of this investigation will be available for use in preparing the Red Mesa and Soda Canyon folios.

NEW YORK.

The mapping of the Quaternary deposits of the Berlin (N. Y.–Mass.) and Hoosick (N. Y.–Vt.) quadrangles was completed in July, and descriptions for folio publication have been nearly completed by

F. B. Taylor. The areal and economic survey of the Paleozoic formations in the Berlin quadrangle, which includes a small portion of Massachusetts, was continued by L. M. Prindle, about 125 miles having been mapped in detail.

The examination and mapping of the Paleozoic formations in the Hoosick quadrangle was completed by Mr. Prindle, who will describe this quadrangle in a folio covering also the Bennington quadrangle.

The study of the Quaternary deposits of the Cambridge and Fort Ann quadrangles was begun by Mr. Taylor.

NORTH CAROLINA.

Manuscripts and maps for a folio describing the Kings Mountain and Gaffney quadrangles, the larger part of which lie in South Carolina, has been nearly completed by D. B. Sterrett.

The Lincolnton quadrangle has been mapped by Mr. Sterrett, who has prepared descriptions for inclusion in a folio to cover also the Gastonia quadrangle, in which field work will be begun this summer.

Some mica deposits in Avery, Mitchell, and Macon counties and the results of the latest prospect work done in 1914 at the Ruby mine, in Cowee Valley, were examined by Mr. Sterrett, who visited several mica manufacturing plants to study the conditions of the industry.

In connection with a report on the marbles of the southeastern United States, which is being prepared in cooperation with the Bureau of Mines, the Bureau of Standards, and the Office of Public Roads, T. Nelson Dale devoted a short time to field investigations in this State.

The preparation of a cooperative monograph on the worms and mollusks of the Upper Cretaceous deposits of the Carolinas, by L. W. Stephenson, to be published by the North Carolina Geological and Economic Survey, has been nearly completed and the report will soon be transmitted. The Cretaceous Crustacea from the State have been described by Miss Mary T. Rathbun, of the United States National Museum, in a report to accompany Mr. Stephenson's paper, and the fossil plants have been described for the same purpose by E. W. Berry.

A monograph describing the Tertiary Mollusca of Virginia and North Carolina, for which Dr. Paul Bartsch, of the National Museum, described several families of the smaller Mollusca, has been completed by Miss Julia Gardner. The services of all those who are engaged on this work, except Mr. Stephenson, were contributed in scientific cooperation, without expense to the Survey.

A monograph on the Pliocene and Pleistocene Foraminifera of the Atlantic and Gulf Coastal Plain, in which the Foraminifera from North Carolina are included, has been transmitted for publication by J. A. Cushman.

NORTH DAKOTA.

A detailed reconnaissance survey, covering about 590 square miles in the Oliver County lignite field, North Dakota, was made by E. T. Hancock, with the assistance of R. C. Moore. The results of this examination, which was made primarily for land classification and to solve certain problems relating to the stratigraphy of the region, have been embodied in a geologic report by Mr. Hancock, now nearly completed. In connection with the field investigations, studies relating to the stratigraphy of the Cannonball marine member of the Lance formation and to the stratigraphy and faunas of the Cretaceous and Eocene formations in surrounding regions were made by T. W. Stanton, who examined exposures north and south of Steel, near Jamestown, between Linton and Missouri River, and along Cannonball and Wisconsin rivers from Solen to Washburn.

The Fort Berthold lignite field is described and mapped in a final report submitted by C. M. Bauer, who has also prepared a short summary report on the lignite resources of North Dakota for inclusion in the general report on the coal fields of the United States.

The geology of the Edgeley and Lamoure quadrangles has been examined for folio publication by H. A. Hard under a cooperative agreement with the State Geological Survey of North Dakota.

OHIO.

A folio for the Hamilton and Mason quadrangles, which were mapped in detail by R. S. Bassler and N. M. Fenneman, as previously reported, is nearly finished, its completion awaiting only the results of additional investigations, largely paleontologic, to be made by E. O. Ulrich in the Cincinnati quadrangle. Some general review work was done by Mr. Ulrich in the quadrangle.

The areal and economic geology of the Woodsfield and Summerfield quadrangles was examined in detail by D. Dale Condit, assisted by R. V. A. Mills and for a short time by C. A. Bonine. Careful attention was given to the structure of the oil sands and the relations of the oil pools to the geologic structure and to the character of the sands themselves. Two economic reports on the structure and oil resources of these quadrangles are now nearly completed and a folio is in preparation.

Some progress has been made in the preparation of a folio text covering the Steubenville and Cadiz quadrangles, on which Mr. Condit had been previously engaged; but this work was interrupted by his detail to examine and classify supposed phosphate-bearing lands in western Wyoming.

A preliminary examination of the Wooster oil and gas field was made by C. A. Bonine, and a report on the geologic structure, the

mode of occurrence of oil and gas, and the prospects of the field has been submitted by Mr. Bonine for publication (Bulletin 621–H).

The field investigation and mapping of the Wellsville quadrangle were carried on by J. H. Hance, special attention being given to the clay deposits and the clay-bearing formations.

The richly carbonaceous Devonian shales were examined and sampled at a number of points by G. H. Ashley, with a view to determining their value for distillation.

OKLAHOMA.

In order to procure further data as to the structure of the oil sands in the Hominy quadrangle, Oklahoma, some additional reconnaissance work was done by Robert H. Wood, whose oil report for the quadrangle is nearing completion and whose folio is well advanced. Considerable progress was made by Mr. Wood on the economic report covering the Cleveland pool.

The Pawhuska quadrangle was revisited by C. D. Smith for the purpose of verifying certain conclusions he reached during the office study of his notes, and considerable progress has been made on the folio covering the quadrangle. The folio for the Claremore quadrangle, which also was visited for slight revision, was nearly completed when, at the end of January, Mr. Smith resigned from the Survey in order to make a more lucrative use, as consulting oil geologist, of his practical knowledge and experience in oil-field geology. However, Mr. Smith has agreed to complete the folio.

Considerable progress has been made by Mr. Smith in the preparation of a folio covering the Sallisaw and Sanbois quadrangles, the geologic mapping of which was begun some years ago by J. A. Taff, a former member of the Survey now in the employ of the Southern Pacific Co. The completion of this folio, which had been delayed pending the receipt of additional data from Mr. Taff, is now subject to further postponement on account of Mr. Smith's resignation.

The areal and economic survey of the McAlester quadrangle was completed a number of years ago by Mr. Taff, who is under agreement to complete a folio for this area.

The Paleozoic geology and the Quaternary deposits in the northern half of the Windingstair quadrangle and the eastern part of the Tuskahoma quadrangle was briefly reviewed by H. D. Miser. The areal work in these quadrangles was begun a number of years ago by Mr. Taff.

The Loco, Duncan, and Lawton districts were examined by C. H. Wegemann, assisted by R. W. Howell and K. C. Heald, with the object of discovering the relation of the oil pools to the geologic structure and of obtaining information for guidance in the extension of known pools and the possible discovery of new ones. Preliminary

accounts, with sketch maps covering the areas, were transmitted to the Oklahoma Geological Survey, by which they have since been published.

Work on the Healdton pool, which was begun last year, was continued by Mr. Wegemann, assisted by Mr. Heald, and a report thereon is in press as Bulletin 621–B. Reports on the Loco and Duncan (Hope) gas fields and on the Lawton gas and oil pool, by Mr. Wegemann and R. W. Howell, are in press as Bulletins 621–C, 621–D, and 621–G, respectively.

Structural examinations, with reference to the possible occurrence of oil and gas, were made in portions of Okmulgee and Okfuskee counties by A. E. Fath, assisted during part of the field season by W. B. Emery and K. C. Heald. A report on "Faulted structure in the vicinity of the recent oil and gas development near Paden, Okfuskee County, Okla.," has been submitted by Mr. Fath. He also prepared a paper for unofficial publication on the segregation of copper ores in the "Red Beds."

The economic and areal survey of the geology of the Foraker quadrangle was begun by Mr. Heald and a similar investigation of the Bristow quadrangle by Mr. Fath.

Additional examinations of the lead and zinc deposits of the Miami district were made near the close of the year by C. E. Siebenthal. The data will be used in a report on these deposits which is now in preparation by him.

"The fauna of the Wewoka formation of Oklahoma," by G. H. Girty, was published as Bulletin 544.

OREGON.

In the Sumpter quadrangle, Oregon, about half of which had previously been examined, the remaining part was geologically surveyed in detail on the scale of 1 : 125,000, for folio publication, by J. T. Pardee and D. F. Hewett under a cooperative agreement with the Oregon Bureau of Mines and Geology, to which a preliminary report on the mineral resources of the quadrangle was submitted for publication. In June Mr. Hewett made some reconnaissance examinations in the region immediately west of the quadrangle. A geologic folio for Sumpter quadrangle is now in preparation for publication by the Federal Survey.

A reconnaissance examination of the Howard mining district was made in August by G. F. Loughlin.

Nitrate prospects in Malheur County, not far from Homedale, Idaho, were visited by G. R. Mansfield, whose report was submitted for publication (Bulletin 620–B).

The investigation of the Eden Ridge coal field was completed by C. E. Lesher, who examined in detail 36 square miles and in recon-

naissance 200 square miles, covering parts of Eden Ridge and Camas Valley. The stratigraphic position of the scattered coal outcrops was determined by Mr. Lesher, thus defining the productive formation. A portable outfit devised for the field determination of the amount of ash in coals is described by Mr. Lesher in Bulletin 621–A.

PENNSYLVANIA.

The region between the Bellefonte and Huntingdon quadrangles, Pennsylvania, which have already been under examination, was reviewed in reconnaissance by Charles Butts, for the purpose of tracing certain formations between the two quadrangles and determining their stratigraphic relations. The folio for the Huntingdon and Hollidaysburg quadrangles is near completion, lacking only a review of certain details. A conference will be held by Mr. Butts and E. S. Moore, geologist engaged in the study of the Bellefonte quadrangle, before the folio for that quadrangle can be completed for publication. In connection with the description by C. D. Walcott, secretary of the Smithsonian Institution, of the Cambrian paleontology and stratigraphy of the United States, Mr. Butts spent some time in working out the Cambrian-Ordovician relations in the Hollidaysburg quadrangle.

A description of the physical features in the Delaware Water Gap quadrangle and the geography of the region was prepared by G. W. Stose. (See New Jersey, p. 497.)

Field work on the Fairfield and Gettysburg quadrangles having been completed, the manuscript and maps for a folio are in preparation by Miss Florence Bascom and G. W. Stose. A petrographic report on the Triassic lavas, for incorporation in this folio, was prepared by J. Volney Lewis.

The folio covering the Elkton and Wilmington quadrangles, by Miss Bascom and B. L. Miller, has been transmitted for publication. (See Maryland, p. 490.)

The geology of the Allentown quadrangle has been the subject of a field conference between Arthur Keith, in charge of the work, and B. L. Miller and H. B. Kümmel, geologists responsible for the mapping of the Allentown and Easton quadrangles, respectively. Mr. Miller has completed the maps and text for the Allentown quadrangle, and Mr. Kümmel is preparing similar material for the Easton quadrangle, the greater portion of which lies in New Jersey. The two quadrangles will be covered by a single folio. A report on the geology and economic resources of the Allentown quadrangle has been submitted by B. L. Miller.

Additional field work, mainly in adjustment of geologic boundaries to a new topographic base for the Reading quadrangle, has been

completed in the Reading and Boyertown quadrangles by Miss Bascom and Edgar T. Wherry, assistant. Mr. Wherry also examined recently operated quarries and mines in both quadrangles in order to complete his description of the economic geology and developments in the area. The pre-Cambrian rocks in the Reading quadrangle were mapped by Miss E. F. Bliss. Miss Bascom's work of preparing the folio is now well advanced.

The survey of the areal geology of the McCalls Ferry and Quarryville quadrangles, begun by E. B. Mathews, was continued by Miss Bliss. The results are to be published in folio form.

Field investigations were carried on by Mr. Wherry and Miss Bliss in the Quakertown and Doylestown quadrangles, the Paleozoic rocks being partly mapped by Miss Bliss and the Triassic rocks by Mr. Wherry. A portion of the folio for these two quadrangles is to be prepared by Miss Bascom and is well advanced toward completion.

Considerable progress has been made by Miss Bascom on the manuscript and maps for the Coatesville and West Chester quadrangles, which will be covered by a single folio, and on the Honeybrook-Phoenixville folio, which she expects to complete during the coming year.

Several local investigations regarding artesian-water conditions in eastern Pennsylvania have been made by Miss Bascom.

Satisfactory progress has been made in the investigation and mapping of the geology of the Frostburg and Flintstone quadrangles, which are to be covered by a single folio. The field and office work by Mr. Stose for his part of the folio has been finished for some time, and the completion of the folio manuscript awaits the descriptions to be furnished by C. K. Swartz for the Devonian and Carboniferous formations. The work is being done in cooperation with the Maryland Geological Survey.

The preparation of maps and descriptions of the geology and mineral resources of the Punxsutawney, Curwensville, and Houtzdale quadrangles has been continued by G. H. Ashley whenever his other duties gave opportunity.

The deposits of cannel coal and the richly carbonaceous shale mined or exposed at several points in western Pennsylvania were examined by Mr. Ashley, who collected a number of samples for tests in order to determine their ultimate value as possible sources of gas or petroleum distillates and distillation by-products.

Some progress has been made in the preparation of the Newcastle folio, although the demands made upon F. W. De Wolf, the author, by his duties as State geologist of Illinois are so overwhelming that little time is available for the Pennsylvania work.

The geology of the Windber quadrangle has been investigated in detail by George B. Richardson, who has submitted a folio to cover

the Windber and Somerset quadrangles, the latter having been examined during the preceding season. An economic report entitled "Geologic structure and coal resources of the Windber and Somerset quadrangles, Pennsylvania," has been nearly completed by Mr. Richardson.

RHODE ISLAND.

In connection with the investigations of the stratigraphy, paleontology, underground water resources, and physiography of the Atlantic Coastal Plain, the examination of Cape Cod and the islands off the south coast of Massachusetts and Rhode Island, including Block Island, was undertaken by J. B. Woodworth.

A report, briefly describing the Rhode Island coal field and discussing in particular the composition and adaptations of the coals of the State, by G. H. Ashley, is in press as Bulletin 615.

SOUTH CAROLINA.

The folio describing the areal and economic geology of the Kings Mountain and Gaffney quadrangles, in South and North Carolina, has been nearly completed by D. B. Sterrett, although minor field examinations at certain points may be needed before the folio can be finished.

The upper Cretaceous formations of South Carolina are discussed in the report by L. W. Stephenson on the worms and mollusks of the deposits of this age in the Carolinas. This report, which is ready for transmission, has been prepared in cooperation with the Geological and Economic Survey of North Carolina, by which it will be published.

A monograph on the Pliocene and Miocene Foraminifera of the Atlantic Coastal Plain, by Joseph A. Cushman, has recently been submitted for publication.

A paper by L. W. Stephenson, entitled "A deep well at Charleston, S. C.," with a report on the mineralogy of the water by Chase Palmer, has been published as Professional Paper 90–H.

SOUTH DAKOTA.

The preparation of a report on the Upper Cambrian geology, Tertiary igneous rocks, and mineral resources of the Black Hills to accompany a quadruple folio covering the Deadwood, Rapids, Hermosa, and Harney Peak quadrangles was continued by Sidney Paige, who investigated the ore deposits of the region. By order of the Assistant Secretary of the Interior, Mr. Paige also examined certain mining claims in the Harney National Forest. The Paleozoic and younger sedimentary formations in these quadrangles are being described by N. H. Darton.

A field study of the stratigraphy of the Cretaceous and Eocene formations in the vicinity of Mobridge was made by T. W. Stanton for purposes of correlation.

TENNESSEE.

In the Waynesboro quadrangle, Tennessee, some additional field examinations necessary to the completion of a folio were made by H. D. Miser, in cooperation with the Tennessee Geological Survey.

An investigation of the outcrops of the Clinton iron ore in the Cumberland Gap, Jonesville, Maynardsville, Morristown, Briceville, and Kingston quadrangles was made by E. F. Burchard, also in cooperation with the State, for the purpose of including the descriptions and maps of these deposits in a bulletin on the red iron ores of eastern Tennessee, northeastern Alabama, and northwestern Georgia.

The report on the Ducktown copper deposits is well advanced. The history and the descriptions of formations and structures have been written by F. B. Laney, and the description of the ore deposits by W. H. Emmons, but Mr. Emmons's part has not yet been adjusted to the part contributed by Mr. Laney and to that to be added by Arthur Keith.

In order more satisfactorily to classify and correlate the Paleozoic formations in portions of the State, sections were studied and numerous collections of invertebrate fossils were made in the eastern regions by R. D. Mesler and in central Tennessee by George H. Girty, in cooperation with H. D. Miser.

A brief field examination of the black shales at a number of points in Tennessee was made by G. H. Ashley, in connection with his study of the problem of the oil and gas resources ultimately to be realized through the distillation of these richly carbonaceous and widespread deposits.

A report on the fossil flora of the Jackson group, which covers a portion of the State, is in preparation by E. W. Berry, who also described the lower Eocene flora in Professional Paper 91, now in press.

In connection with the study of the post-Tertiary history and the physiography of the Mississippi embayment area an examination of the physiography and Quaternary geology of western Tennessee is in progress by E. W. Shaw.

In accordance with a plan for cooperating with the Bureau of Mines, the Bureau of Standards, and the Office of Public Roads in the investigation of the building materials of the United States, T. Nelson Dale examined the marble deposits of eastern Tennessee. This investigation was made in cooperation also with the State geological survey, which is expected to furnish areal and stratigraphic details, the data respecting the mechanical composition and the special characteristics and qualities of the marbles to be prepared by Mr. Dale. Physical tests of samples submitted have been furnished by the Bureau of Standards. The preparation of Mr. Dale's report is well advanced.

The phosphate deposits in the vicinity of Mount Pleasant, the center of the brown rock phosphate industry in the State, have received some preliminary field study by W. C. Phalen, who has brought up to date the mapping of the important deposits of brown rock, sampled the deposits for analyses, and studied the conservation of these important resources. The results of these studies will probably be included in a general economic report on the phosphate deposits of the southern Appalachian region.

In accordance with a cooperative arrangement between the Bureau of Mines, the Tennessee Geological Survey, and the United States Geological Survey, all the coal mines in Tennessee producing coal on a commercial scale and a number of small and intermittently operated coal mines were examined and sampled by the Geological Survey, all the samples being taken by one geologist, Frank R. Clark. The sampling was done according to the practice of the Geological Survey and the Bureau of Mines, which made the analyses. The analyses will probably be published by this Survey, by the State, and by the Bureau of Mines.

TEXAS.

A reconnaissance of the deposits of brown iron ores and iron carbonate ores in northeastern Texas was made by E. F. Burchard, whose report on the iron ores of Cass, Marion, Morris, and Cherokee counties is in press as Bulletin 620–E.

In connection with the investigation of nonmetalliferous mineral deposits in various regions, the supposed phosphate deposits in Brewster County were examined by W. C. Phalen, in company with J. A. Udden, of the bureau of economic geology and technology of the University of Texas. Mr. Phalen also inspected the cores of drillings made in exploration for sulphur at Bryan Heights. Observations noted in connection with these examinations are incorporated in his report on the production of sulphur for 1914.

In the Survey's investigation of all reported discoveries of potash salts samples have been taken for analysis at a number of points in Texas. Close attention is given to all borings in the "Red Beds" region of the State, and this Survey has offered to supplement the work of the State University through the field observation of drilling and the analyses of samples.

The relations of the Fayette, Catahoula, and Fleming formations in Texas were studied by G. C. Matson and Alexander Deussen, and a report on the Catahoula formation, prepared by Mr. Matson in cooperation with E. W. Berry, was transmitted for publication. Reports on the fossil flora of the Claiborne and Jackson groups were being prepared by Mr. Berry.

The manuscript for a report on the geology of the Coastal Plain of Texas west of Brazos River, by Alexander Deussen, is nearing

completion. The underground water supply of Lasalle and McMullen counties is discussed by Mr. Deussen and R. B. Dole in a report transmitted for publication by the water-resources branch (Water-Supply Paper 375–G).

Reconnaissance examinations, with special reference to the possible occurrence of oil or gas pools, were made by C. H. Wegemann, near Mineral Wells and Quanah, and reports containing the conclusions reached have been submitted for publication in the current volume of "Contributions to economic geology."

UTAH.

A general summary report on the ore deposits of Utah, by B. S. Butler and G. F. Loughlin, has been materially advanced during the year, and the authors expect to complete it during the coming year.

The Tintic district was revisited by Waldemar Lindgren and Mr. Loughlin to procure additional material for their report on the geology and ore deposits. This report has since been transmitted by the senior author for publication. Mr. Loughlin also made a brief visit to the Ophir district to study the occurrence of the zinc ores.

In response to a special request from mining men, Mr. Loughlin revisited Marysvale for the purpose of further examining the alunite deposits and later submitted a brief report. He also examined the ore deposits at Fortuna, near Beaver.

The search for uranium and vanadium deposits in southeastern Utah, begun by F. L. Hess but temporarily relinquished by him on account of illness, was continued by B. S. Butler, assisted by W. H. Whitehead, in Wayne, Garfield, and San Juan counties. In addition to examining the horizons at which uranium minerals are known to occur, the stratigraphy of the Colorado Plateau and Henry Mountains regions as interpreted by Dutton and Gilbert was reexamined, and correlations were made with areas farther north and east that had been mapped by C. T. Lupton and E. G. Woodruff.

A reconnaissance report on the Cottonwood-American Fork area by Messrs. Butler and Loughlin, with a section on the history of mining and production by V. C. Heikes, was submitted for publication (Bulletin 620–I).

The physiography and geologic history of the Colorado Plateau have been the subject of a general study by H. E. Gregory, which he expects to continue as opportunities arise and funds are available.

The occurrence of phosphate deposits in rocks of Mississippian age in the vicinity of Logan was investigated by E. H. Finch, whose report is in preparation.

A preliminary reconnaissance examination of the south and west slopes of the Uinta Mountains to determine whether or not phosphate is present and under what conditions it occurs was made by A. R. Schultz.

A brief examination of the salts in Salduro Salt Flat, with special reference to the possible presence of potash in commercial amounts, was made by Hoyt S. Gale.

The detailed survey begun in the Book Cliffs coal field at Sunnyside, Carbon County, in 1911, has been continued westward each succeeding year, and in the season of 1914 another 15-minute quadrangle, the Castle Gate, was covered. Nothing has yet been published on these areas, but an economic bulletin and a folio are in preparation for each quadrangle completed, namely, Sunnyside, Wellington, and Castle Gate. In this investigation the outcrop of each coal bed of economic value was traced and mapped by F. R. Clark, the geologist in charge, and many exact data were obtained regarding both horizontal and vertical locations of measured sections of the coal beds. In spite of the rugged character of the cliffs, which made the work difficult and laborious, an area of 230 square miles was examined in detail.

In addition to the Castle Gate quadrangle an area of about 80 square miles in Morgan County was examined in detailed reconnaissance by Mr. Clark to determine the possible occurrence of coal in commercial quantities. The land has been classified, and a short geologic report is now in preparation by Mr. Clark.

The ozokerite deposits near Colton, Soldier Summit, and Media were examined by H. M. Robinson, who has prepared and submitted for publication a report on the ozokerite deposits of Utah. The oil shale near Mount Pleasant was examined by Mr. Robinson in company with David T. Day, in cooperation with the Bureau of Mines.

A geologic report on the Emery coal field by C. T. Lupton has been submitted for publication, and a report on the Coalville coal field, by C. H. Wegemann, based on field work done in a previous year, has been published as Bulletin 581–E.

Some field observations of the ancient Lake Bonneville basin were made by G. K. Gilbert, in connection with his brief description of the history of the lake and of Great Salt Lake, for use in the Overland Route guidebook (Bulletin 612). In connection with the preparation of a discussion of the geologic structure in the Great Basin region, observations on the master faults associated with the mountain ranges were made by Mr. Gilbert.

VERMONT.

In the Bennington quadrangle, Vermont, detailed mapping was completed by L. M. Prindle. During this work Mr. Prindle was joined for a conference by Prof. G. H. Perkins, State geologist, and for a review of the work of Arthur Keith, who also discussed the geologic work of the Survey in Vermont with Prof. Perkins. Special investigation was made by Mr. Keith of the stratigraphy and faulted

structure of the Taconic Mountains in the Brandon, Rutland, Castleton, Pawlet, and Wallingford quadrangles for the purpose of solving some intricate problems involved in this work before the southern Vermont folios can be submitted for publication. A brief reconnaissance was made by Mr. Keith in the Ludlow and Brattleboro quadrangles.

The mapping of the Quaternary deposits of the Hoosic and Bennington quadrangles was completed by F. B. Taylor, who has nearly finished the descriptions to be incorporated in a folio covering these quadrangles. The field examination of the Quaternary deposits of the Pawlet and Equinox quadrangles was begun by Mr. Taylor.

VIRGINIA.

The detailed investigation and mapping of the southwestern Virginia coal field was continued in cooperation with the Virginia State Geological Survey. The geologic field examinations, which were contemporaneous with the topographic mapping and conducted from the topographic camp, were extended over the Virginia portions of the Hurley, Gilbert, Matewan, Iaeger, and Welch quadrangles. This work was in charge of Henry Hinds, who was assisted on the part of the State by T. K. Harnsberger. Progress was made on the Bucu and Clintwood geologic maps. The pre-Pennsylvanian rocks of the Bucu quadrangle were examined by G. W. Stose in company with Mr. Hinds.

For the purpose of comparing and correlating several of the older geologic formations in the region under detailed investigation, Mr. Hinds made a brief reconnaissance, with E. O. Ulrich and Charles Butts, of the formations exposed near Roanoke and Cleveland.

The preparation of a report embodying the results of the study of the coals in the Pocono formation of Virginia, which were examined the previous spring, was begun by R. W. Howell. This work was done in cooperation with the State Geological Survey.

In the Abingdon quadrangle detailed areal work on the Paleozoic formations was continued by G. W. Stose, who will describe and map most of them in the Abingdon folio, for which the pre-Paleozoic rocks will be treated by Arthur Keith. Although this project is not cooperative, Mr. Stose was joined for a time by T. L. Watson, State geologist, who, with F. A. Wilder, of the State Survey, is cooperating with Mr. Stose in the preparation of reports on salt and gypsum in the State.

A number of sections of the Devonian formations in southwestern Virginia were visited by Charles Butts, E. O. Ulrich, and R. D. Mesler, for the purpose of correlating the formations in this region with those in other regions and States of the Appalachian province.

A monograph describing the Tertiary Mollusca of Virginia and North Carolina has been completed by Miss Julia Gardner.

Mica deposits in Amelia and Hanover counties and an amethyst deposit in Louisa County were examined by D. B. Sterrett.

WASHINGTON.

The Glacier coal field, in Whatcom County, Wash., was examined by M. R. Campbell for the purpose of classifying the land and valuing that which is underlain by workable coal. The report on this field, which was found to contain a considerable quantity of high-grade anthracite, has been delayed in the hope that additional prospecting would be done so as to afford fuller and more exact information relating to the coal.

Several small tracts near Molson were examined by E. L. Jones, jr., to ascertain their probable value for metal mining or agriculture. Mr. Jones also made a reconnaissance examination of about 100 square miles in the Conconully district.

A report describing the mineral deposits and geology of the Colville Indian Reservation, based on an examination made in previous seasons for purposes of classification, was submitted by J. T. Pardee for publication in "Contributions to economic geology."

WEST VIRGINIA.

Some progress has been made in the preparation of a report on the semianthracite coal resources of the Pocono formation, in West Virginia, by R. W. Howell, but further work was postponed on account of the detail of Mr. Howell for investigations in the Mid-Continent oil region.

An examination was made by G. H. Ashley of the black shale at a number of points in the State in connection with an investigation of the value of such shale for distillation.

The survey of the Williamsport quadrangle, including parts of Maryland and Pennsylvania, was completed by G. W. Stose, and the results will be published in the Williamsport-Hagerstown folio. Mr. Stose and G. P. Grimsley, of the State Survey, held a field conference in this area, the State Survey being interested in this work, although not cooperating financially.

WISCONSIN.

Special examinations of the glacial deposits of northwestern Wisconsin were made by Frank Leverett in October, 1914, and, together with Dr. Samuel Weidman, of the Wisconsin Geological and Natural History Survey, in June, 1915, in order to correlate the deposits in Minnesota with those in Wisconsin and to complete the data for a report on the extent and relations of the Superior ice lobe in Michigan, Wisconsin, and Minnesota.

An agreement has been made with Dr. Weidman for the completion of a folio covering the Wausau and Marathon quadrangles, in cooperation with the State Survey.

Some additions were made to the manuscript on the Quaternary geology of southeastern Wisconsin, which was submitted for publication by W. C. Alden.

In cooperation with the geologists of the State Survey the stratigraphy and paleontology of the early Paleozoic formations were investigated by E. O. Ulrich.

WYOMING.

The areal mapping and the investigations relating to the possibilities of the presence of oil and gas in the structural domes and anticlines of central Wyoming between Casper and Lander, in Natrona, Fremont, and Carbon counties, commenced in 1913, was completed by C. J. Hares, assisted by J. B. Reeside, jr., and K. C. Heald. An area of about 2,800 square miles was covered, of which 1,940 miles was mapped in detail and the remainder in detailed reconnaissance. Special attention was given to the structure of the rocks and to the late Tertiary formations. The total area mapped in the two seasons is about 5,000 square miles, upon which a short preliminary report has been submitted for publication, and a final report is now being prepared.

In the eastern portion of the Bighorn Basin a detailed geologic examination was begun by C. T. Lupton, assisted by J. D. Northrop and W. P. Woodring, special attention being given to the structure of the rocks in order to discover those structures which are favorable to the accumulation of oil and gas. A preliminary report entitled "Oil and gas near Basin, Big Horn County, Wyo." (Bulletin 621–L) and a more detailed report on oil fields in the southern part of the Bighorn Basin have been submitted by Mr. Lupton.

Field work was resumed by C. F. Bowen in the Saddleback quadrangle, forming part of an examination made primarily for the purpose of classifying and valuing the coal lands embraced in the Saddleback, Hanna, and Walcott quadrangles. Exact horizontal and vertical locations were determined by plane-table methods for all sections measured on the coal beds as well as for geologic boundaries and structural features. Economic and folio reports for the Saddleback quadrangle are being prepared by Mr. Bowen.

In the Ilo, Oregon Basin, and Meeteetse quadrangles field examinations were completed by D. F. Hewett, who has submitted for publication an economic report covering the two quadrangles last named and is also preparing folios for the area examined. The geologic mapping was done by plane-table methods and independently of the topographic sketching, which was carried on simultaneously by the topographic branch.

The survey of the central part of the Powder River coal field and the reexamination of the Salt Creek oil field were begun by C. H. Wegemann and R. W. Howell.

Reconnaissance examinations were made of ore deposits in the North Laramie Mountains and of the Atlantic gold district, in the southeastern part of the State, by A. C. Spencer, who has transmitted a report on the North Laramie Mountain region and has in preparation his report on the Atlantic district.

A field study of the Bighorn limestone as exposed in the Wind River Mountains near Lander, in the Owl Creek Mountains, and in the Bighorn Mountains was made by Edwin Kirk.

An examination for phosphate was made by G. R. Mansfield in the Salt River region east of Star Valley. Data for the classification of the land in seven townships have been submitted by Mr. Mansfield, who has completed, for publication as a bulletin, a report on the economic resources of the region.

A report of a reconnaissance in southeastern Idaho and western Wyoming, with special reference to phosphate deposits, was submitted by A. R. Schultz.

CANAL ZONE.

The investigations made for the purpose of determining the geologic formations, their correlation, and the geologic history of the Canal Zone and adjacent regions of Panama and Costa Rica have been continued during the year, and most of the series of reports planned with the cooperation of the Smithsonian Institution, the Isthmian Canal Commission, and the United States Geological Survey are approaching completion. A manuscript describing the physiography, stratigraphy, geologic structure, geologic history, and economic geology of the Canal Zone and adjacent areas, by D. F. MacDonald, is about one-third completed. A report on the fossil calcareous algæ of the Canal Zone has been submitted by Dr. M. A. Howe, of the New York Botanical Garden, and reports on the Foraminifera and on the fossil Crustacea have been completed by Joseph A. Cushman and Miss M. J. Rathbun, respectively. Progress has been made in the report on the fossil plants of higher orders by E. W. Berry, on the fossil corals by T. W. Vaughan, on the fossil echinoids by R. T. Jackson, and on the fossil Bryozoa by R. S. Bassler and F. Canu. This series of reports, which will contain important conclusions as to geologic correlation and geologic history, will be published by the Smithsonian Institution.

ANTILLES.

A series of reports similar to those relating to the Canal Zone is in preparation for the Lesser Antillean Islands. The materials, largely paleontologic, submitted for study and the opportunities for field examinations are occasional and are possible only through the courtesy of private citizens, local governments, or scientific institutions. The systematic investigations, which are under the direction of

T. W. Vaughan, have been made possible through grants by the Carnegie Institution of Washington. Most of the cooperating geologists and paleontologists are not officers of the United States Geologica Survey, but, besides Mr. Vaughan, who is studying the general physiography and general geology and is describing the fossil corals, C. Wythe Cooke has already prepared a report on the fossil Mollusca from the Lesser Antillean Islands and from Cuba. A report on the Foraminifera is in preparation by Joseph A. Cushman.

The investigations relating to the Canal Zone and the Antilles are of great importance to the understanding of the geology of both the eastern and western sides of continental North America, as only by accurate paleontologic knowledge of the West Indies and Central America can the geologic formations and the fossil associations on the two sides of the continent be correlated.

HAWAII.

A report by Whitman Cross on the "Lavas of Hawaii and their relations" has been published as Professional Paper 88.

DIVISION OF ALASKAN MINERAL RESOURCES.

APPROPRIATION AND CLASSES OF WORK.

On April 6, 1914, $100,000 was appropriated for the continuation of the investigation of the mineral resources of Alaska. The availability of funds at this early date made it possible to start the field work promptly and to carry it on economically, and the results were in strong contrast to those of the two previous years, when the delay in granting funds until summer greatly hampered the field work and made it very expensive.

The work carried on under this appropriation, as in previous years, included reconnaissance and detailed geologic and topographic surveys, special investigations of mineral resources, and the collection of statistics on mineral production.

PERSONNEL.

On July 1, 1914, the personnel of the division consisted of 1 geologist in charge, 11 geologists, 4 topographers, 3 clerks and 1 draftsman on annual salaries, 2 field assistants, and 22 camp hands and recorders. On June 30, 1915, the personnel included 1 geologist in charge, 11 geologists, 4 topographers, 1 engineer, 3 clerks, and 1 draftsman on annual salaries, 1 clerk on monthly salary, 2 geologists on per diem salary, 1 field assistant, and 28 camp hands and recorders.

FIELD OPERATIONS DURING SEASON OF 1914.

Areas covered and allotments.—Ten parties were engaged in surveys and investigations during 1914. The area covered by exploratory geologic surveys, on a scale of 1: 500,000 (8 miles to the inch), amounts to 1,000 square miles; by reconnaissance geologic surveys, on a scale of 1: 250,000 (4 miles to the inch), 7,700 square miles; by detailed geologic surveys, on a scale of 1: 62,500 (1 mile to the inch), 325 square miles. Much of the time of the geologists was devoted to the investigation of special field problems in the important mining districts, the results of which can not be presented in terms of area. About 600 square miles was covered by exploratory topographic surveys on a scale of 1: 500,000, 10,300 square miles by reconnaissance topographic surveys on a scale of 1: 250,000, and 10 square miles on a scale of 1: 24,000 (2.64 inches to 1 mile).

The following table shows the allotment, including both field and office expenses, of the total appropriation to the districts investigated. In addition to this, a balance of about $6,000 from last year's appropriation was expended in equipping the parties for the season's field work. In preparing this table the general office expenses were divided among the districts in proportion determined by the cost of the surveys in each district, allowance being made for variations in the character of the work The results are expressed in round numbers. The "general investigations" include the cost of special studies of geology and mineral resources which were not of an areal character. The unallotted balance has been used for equipment of field parties and expenses up to the close of the fiscal year 1915.

Approximate geographic distribution of appropriation for Alaska investigations, 1914.

Southeastern Alaska	$6,000
Copper and Susitna basins	25,000
Prince William Sound	6,500
Kuskokwim and Mulchatna River basins	22,000
White and Chisana River basins	14,000
Yukon basin	2,000
Seward Peninsula	1,500
General field and office investigations	12,000
Allotted to field investigations of 1915	11,000
	100,000

In the following table the approximate amount of money devoted to each class of investigations and surveys is indicated. It is not possible to give the exact figures, as the same party or even the same man may have carried on two different kinds of work, but this statement will help to elucidate a later table, which will summarize the complete areal surveys.

Approximate allotments to different kinds of surveys and investigations, 1914.

Geologic and topographic exploration	$4,400
Geologic reconnaissance surveys	13,000
Detailed geologic surveys	15,600
Special geologic investigations	13,000
Reconnaissance topographic surveys	22,500
Detailed topographic surveys	4,300
Collection of statistics	1,400
Miscellaneous, including administration, inspection, clerical salaries, office supplies and equipment, and map compilation	14,800
Allotted to field investigations, 1915	11,000
	100,000

Allotment for salaries and field expenses, 1914.

Scientific and technical salaries	$36,530
Field expenses	36,715
Clerical and other office and miscellaneous expenses	15,755
Allotted to field investigations, 1915	11,000
	100,000

Progress of work.—The following table exhibits the progress of investigations in Alaska and the annual appropriations since systematic surveys were begun in 1898:

Progress of surveys in Alaska, 1898–1914.

Year.	Appropriation.	Areas covered by geologic surveys.			Areas covered by topographic surveys.[a]					Investigations of water resources.	
		Exploratory (scale 1:625,000 or 1:1,000,000).	Reconnaissance (scale 1:250,000).	Detailed (scale 1:62,500).	Exploratory (scale 1:625,000 or 1:1,000,000).	Reconnaissance (scale 1:250,000; 200-foot contours).	Detailed (scale 1:62,500 and larger; 25, 50, or 100 foot contours).	Lines of levels.	Bench marks set.	Gaging stations maintained part of year.	Measurements to stream volume.
		Sq. m.	*Sq. m.*	*Sq. m.*	*Sq. m.*	*Sq. m.*	*Sq. m.*	*Miles.*			
1898	$46,189	9,500	.....	.....	12,840	2,070	.....	.....	.....	.....	.....
1899	25,000	6,000	.....	.....	8,690	.....	.....	.....	.....	.....	.....
1900	60,000	3,300	6,700	.....	630	11,150	.....	.....	.....	.....	.....
1901	60,000	6,200	5,800	.....	10,200	5,450	.....	.....	.....	.....	.....
1902	60,000	6,950	10,050	.....	8,330	11,970	96	.....	.....	.....	.....
1903	60,000	5,000	8,000	96	.....	15,000	.....	.....	.....	.....	.....
1904	60,000	4,050	3,500	.....	800	6,480	480	86	19	.....	.....
1905	80,000	4,000	4,100	536	.....	4,880	787	202	28	.....	.....
1906	80,000	5,000	4,000	421	.....	13,500	40	.....	.....	14	286
1907	80,000	2,600	1,400	442	.....	6,120	501	95	16	48	457
1908	80,000	2,000	2,850	604	.....	3,980	427	76	9	53	556
1909	90,000	6,100	5,500	450	6,190	5,170	444	.....	.....	81	703
1910	90,000	.....	8,635	321	.....	13,815	36	.....	.....	60	420
1911	100,000	8,000	10,550	496	.....	14,460	246	.....	.....	68	369
1912	90,000	.....	2,000	525	.....	.....	298	.....	.....	60	381
1913	100,000	3,500	2,950	180	3,400	2,535	287	.....	.....	24	185
1914	100,000	1,000	7,700	325	600	10,300	10	.....	.....	.....	.....
	1,261,189	73,200	83,735	4,396	51,680	126,880	3,652	450	72	.....	.....
Percentage of total area of Alaska		12.48	14.28	0.75	8.81	21.64	0.62	.....	.....	.....	.....

[a] The Coast and Geodetic and International Boundary surveys and the General Land Office have also made topographic surveys in Alaska. The areas covered by these surveys are, of course, not included in these totals.

General work.—Alfred H. Brooks, geologist in charge, was engaged in office work until July 6, when he started for Alaska. He visited Survey parties at Juneau, Valdez, Kotsina River, and Fairbanks, returning to Washington October 7.

George C. Martin was engaged during the summer on the Mesozoic stratigraphy of Alaska. Mr. Martin, accompanied by R. M. Overbeck as assistant, visited important localities in southeastern Alaska and in the Chitina and Yukon valleys. Arthur Hollick was employed for 64 days in continuing the study of Alaska Cretaceous and Tertiary floras.

R. H. Sargent continued the general supervision of the topographic surveys and map compilation in addition to carrying on his own field work. E. M. Aten continued as office assistant to the geologist in charge and supervised the office work during the field season. He also continued to assist in collecting statistics of the production of precious metals in Alaska.

Southeastern Alaska.—D. C. Witherspoon worked on detailed topographic surveys in the Juneau district. Rain prevented work on 45 days and greatly hampered it much of the rest of the season. Nevertheless, Mr. Witherspoon covered the area by triangulation and mapped 9.75 square miles on a scale of 1 : 24,000, with 50-foot contours. Mr. Eakin devoted about 10 days in the fall to the study of mining developments in the Juneau and Berners Bay districts.

Copper River and Susitna basin.—Detailed geologic mapping of the west end of the Kotsina-Chitina copper belt, begun in 1912, but interrupted in 1913, was completed in 1914 by F. H. Moffit, assisted by J. B. Mertie, who together mapped the geology and studied the mineral resources of an area of 185 square miles.

A topographic reconnaissance survey was carried by J. W. Bagley from Copper Center to the head of Klutina River and thence northwestward to the Susitna, an area of 4,000 square miles being surveyed by phototopographic methods, on a scale of 1 : 250,000, with 200-foot contours. Theodore Chapin, who accompanied the party as geologist, mapped an area of about 3,600 square miles. He also examined the gold placers of the Nelchina basin. This survey is an important connecting link between areas previously mapped in the Copper, Susitna, and Matanuska valleys.

Prince William Sound.—A detailed geologic survey and study of mineral resources of the Port Valdez district was begun in 1914 by B. L. Johnson, assisted by G. L. Harrington, covering 140 square miles.

Lake Clark-Iditarod region.—An exploration of the large, almost unknown region lying between Lake Clark and the Iditarod district was undertaken in 1914 by a party under R. H. Sargent, topographic engineer, and P. S. Smith, geologist. The topographic surveys

covered 4,800 miles and the geologic surveys 3,500 square miles. Some of the quicksilver deposits of the Kuskokwim region were also examined.

Lower Kuskokwim basin.—A. G. Maddren, assisted by Burt Kennedy, made a reconnaissance in the lower Kuskokwim basin. From Iditarod they went overland to Kuskokwim River, down that river, and up several tributary streams, making an examination of the Aniak-Tuluksak placer district and exploratory topographic surveys of about 600 square miles. Besides the gold placers, some copper and quicksilver deposits were examined.

Seward Peninsula.—In view of important developments in the York tin district a supplementary examination of this field was undertaken by H. M. Eakin, who also investigated the mining developments near Nome and made a brief study of the iron deposits in the Sinuk basin, about 40 miles from Nome.

Yukon basin.—Owing to the development of gold placers in the Chisana district in the upper Tanana Valley C. E. Giffin was detailed to extend the topographic surveys in this field. He surveyed Skolai Pass, extended the previous mapping in the Tanana and White River basins eastward to the international boundary, made reconnaissance surveys of about 1,500 square miles, for publication on a scale of 1:250,000, and revised about 1,500 square miles of the old mapping. The wagon road from Willow Creek to Chitina, a distance of 40 miles, together with the adjacent country, was also surveyed in the autumn, making an additional area of revision of about 150 square miles. S. R. Capps made a study of the Chisana placer district and mapped the geology of an adjacent area of about 600 square miles.

H. M. Eakin devoted about three weeks to the investigation of the mining developments in the Hot Springs and Fairbanks districts.

FIELD AND OFFICE WORK FOR SEASON OF 1915.

Alfred H. Brooks will continue his general geologic investigations in different parts of Alaska. G. C. Martin will complete the preparation of a report on the Mesozoic stratigraphy of Alaska. A. G. Maddren will complete reports on the Kuskokwim region, the Yakataga region, and the international boundary region in northeastern Alaska. Arthur Hollick will continue work on a report on Cretaceous and Mesozoic floras. G. A. Waring is investigating the hot springs of Alaska and will also collect data on the quality of the surface waters. D. C. Witherspoon is continuing the preparation of a new base map of the Juneau district on a scale of 1:24,000. The water powers of southeastern Alaska are being investigated by George H. Canfield, in cooperation with the Forest Service. Theodore Chapin is studying the geology and mineral resources of the Ketchikan district. A recon-

naissance geologic survey and investigation of the mineral resources of the upper Chitina basin is being made by F. H. Moffit and R. M. Overbeck. B. L. Johnson is completing a detailed geologic survey and study of the mineral resources of the Port Valdez district. He will later extend a reconnaissance geologic survey in the Prince William Sound region. Topographic and geologic reconnaissance surveys and investigations of mineral resources are being made in the Knik and Turnagain Arm region by J. W. Bagley and S. R. Capps. Time permitting they will also make similar surveys north of the Willow Creek district. Eliot Blackwelder is engaged in studying the Paleozoic stratigraphy of the upper part of the Yukon basin in Alaska. Topographic reconnaissance surveys of the Ruby district and the region lying to the south as far as Kuskokwim River are being made by R. H. Sargent and C. E. Giffin, and the geology and mineral resources of the same region are being studied by J. B. Mertie and G. L. Harrington. H. M. Eakin will explore the region lying between Cosna River, tributary to the lower Tanana, and the Ruby district, on the Yukon.

COLLECTION OF STATISTICS.

The work of collecting statistics of the annual production of gold, silver, and copper, begun in 1905, was continued during the year. Preliminary estimates of mineral production were published on January 1, 1915. The progress report for 1914 (Bulletin 622), containing figures on mineral production, was transmitted in June. An abstract of this report, including the mineral statistics, was also transmitted in June for inclusion in the Survey's annual volume, Mineral Resources of the United States, for the calendar year 1914.

PUBLICATIONS.

During the year one professional paper (No. 87), three bulletins (Nos. 576, 578, 592), one water-supply paper (No. 342), and one separate of a water-supply paper (No. 345–F) relating to Alaska were issued.

Two Alaska maps were issued for sale—a general map of Alaska (scale 1:1,500,000) and a map of the Port Valdez district (scale 1:62,500).

Three bulletins (Nos. 605, 607, 608), one water-supply paper (No. 372), and one separate of a professional paper (No. 95-D) are in press. Manuscripts of the following reports have been completed: Mineral resources of Alaska, report on progress of investigations in 1914, by Alfred H. Brooks and others (Bulletin 622); the Yukon-Koyukuk region, Alaska, by H. M. Eakin; and the Chisana-White River district, Alaska, by S. R. Capps.

The following reports are in hand:

Geology of the Glacier Bay and Lituya region, Alaska, by F. E. Wright and C. W. Wright, including geologic reconnaissance map.
The Lake Clark-Iditarod region, Alaska, by P. S. Smith.
The Kotsina-Kuskulana district, Alaska, by F. H. Moffit.
The lower Kuskokwim region, Alaska, by A. G. Maddren.
The Nelchina-Susitna region, Alaska, by Theodore Chapin.
The Yakataga district, Alaska, by A. G. Maddren.
The upper Matanuska basin, Alaska, by G. C. Martin.
The Mesozoic stratigraphy of Alaska, by G. C. Martin.
Geology of the region along the international boundary, Alaska, from Porcupine River to the Arctic Ocean, by A. G. Maddren, including detailed geologic map.
The Cretaceous and Mesozoic floras of Alaska, by Arthur Hollick.

The office work on the three topographic maps named below, besides the three noted above as issued, were completed:

Broad Pass region, by J. W. Bagley; scale 1 : 250,000; contour interval 200 feet.
Matanuska Valley, by R. H. Sargent; scale 1 : 62,500; contour interval 100 feet.
Relief map of Alaska, compiled by J. H. Renshawe; scale 1 : 1,500,000.

The following maps are in hand:

Kotsina-Kuskulana district, by D. C. Witherspoon; scale 1:62,500; contour interval 100 feet.
Lake Clark-Iditarod region, by R. H. Sargent; scale 1:250,000; contour interval 200 feet.
Chisana-White River region, by C. E. Giffin; scale 1:250,000; contour interval 200 feet.
Nelchina-Susitna region, by J. W. Bagley; scale 1:250,000; contour interval 200 feet.
Juneau mining district, by D. C. Witherspoon; scale 1:24,000; contour interval 50 feet.
Lower Kuskokwim region, by A. G. Maddren; scale 1:500,000; contour interval 500 feet.
Yukon-Tanana region (compiled); scale 1:500,000; contour interval 500 feet.

SCIENTIFIC RESULTS.

Mr. Martin's investigations of the Mesozoic stratigraphy have shown that there is a wide development of Upper Triassic strata in southeastern Alaska, part of the supposed Carboniferous limestones having proved to be of Triassic age; that marine Upper Cretaceous rocks are well developed in the Chitina Valley, where no marine strata younger than the Jurassic had previously been recognized, and that the Upper Cretaceous plant-bearing beds extend up the Yukon Valley nearly to the Canadian boundary.

Mr. Maddren discovered some fossiliferous Upper Carboniferous limestones and tuffs on Kuskokwim River, many miles from any previously known Carboniferous rocks.

Mr. Capps has found a Devonian fauna in the older volcanic rocks of the Chisana district, apparently in the same general belt as the

Devonian locality discovered by Messrs. Moffit and Pogue at Broad Pass in 1913, though many miles distant. These two are the only known occurrence of Devonian rocks south of the Alaska Range, except in southeastern Alaska.

Mr. Capps discovered evidence of an older epoch of glaciation in the upper White River basin. Here there is an indurated tillite which has been more or less folded and antedates the glaciation that produced the present land forms. In the Lake Clark-Kuskokwim basin Mr. Smith found that the westward limit of glaciation was nearer the Kuskokwim than had been previously supposed. Mr. Maddren found evidence of a locally glaciated area in the mountains southeast of lower Kuskokwim River.

DIVISION OF CHEMICAL AND PHYSICAL RESEARCH.

This division is in charge of George F. Becker, geologist, who has immediate direction of geophysical researches. The staff in the chemical laboratory forms essentially a section in charge of F. W. Clarke, chief chemist.

The work of the chemists has consisted for the most part of routine analyses of specimens submitted to the division for determination. During the year 423 quantitative analyses and 869 qualitative determinations have been made. Nevertheless, it has been possible to carry on some researches connected with the geologic problems on which the Survey is engaged.

Continuing the investigation of the composition of the hard parts of various invertebrates living in the cold and in the warm waters of the seas, in order to ascertain the conditions under which magnesium carbonate is deposited in large amounts instead of calcium carbonate, analyses of the fossil remains of a number of brachiopods, corals, alcyonarians, and other marine animals were made by W. C. Wheeler under Mr. Clarke's direction. A paper by Mr. Clarke and Mr. Wheeler on the composition of the brachiopod shells was published in the Proceedings of the Washington Academy of Sciences. Another contribution giving the results of the analyses of the fan corals is now in preparation.

In addition to his administrative work in the laboratory, Mr. Clarke has revised and brought up to date the material for the third edition of "The data of geochemistry" (Bulletin 616). The second edition, published as Bulletin 491, was printed in 1911.

Some research work on the methods of separating vanadium from large quantities of chromium has been pursued by George Steiger, whose time, however, has been mostly taken up by routine analyses, the purchase of supplies, and other administrative duties.

In making analyses of rocks submitted by Survey geologists, R. C. Wells found that water from a mine near Idaho Springs, Colo.,

resembling ink in appearance, owed its color to the presence of nearly 8 grams of molybdenum oxide per liter; also that a rich gold ore from Goodsprings, Nev., was essentially a plumbojarosite, containing 0.22 per cent palladium and 0.05 per cent platinum. In separating salts from the water of Great Salt Lake, Mr. Wells found that in the interval between 0° and −1° C. the salt that separates is the mineral mirabilite, $Na_2SO_4.10H_2O$. A manuscript entitled "The fractional precipitation of some ore-forming compounds at moderate temperatures" was completed by Mr. Wells for publication as Bulletin 609.

As the result of his continued chemical studies of silver enrichment, Chase Palmer, who has been associated with Edson S. Bastin, of the division of geology, in the field investigations, published two papers—"Bornite as silver precipitant," in the Journal of the Washington Academy of Sciences, and "Tetranickel-triarsenide, its capacity as silver precipitant," in Economic Geology and in Zeitschrift für Krystallographie und Mineralogie. The research in silver enrichment, begun by the section of metalliferous deposits of the division of geology, is still in progress.

A report on the mineralogy of artesian well waters beneath Charleston, S. C., published in Professional Paper 90–H, contains a simplified statement by Mr. Palmer of the principles of the geochemical interpretation of water analyses. A part of Mr. Palmer's time has been given to routine quantitative and qualitative analyses of minerals and quantitative analyses of waters.

An extensive study of the vanadium minerals was made by W. T. Schaller. Analyses were made of several vanadium minerals from Utah and two new species from Peru, and of a new copper silicate from Arizona. Mr. Schaller also determined the optical properties of all the available gahnites. He made a field study of the granitic pegmatite intrusions near Pala, San Diego County, Cal., and of a reported occurrence of tin ore in the same county.

A number of analyses of phosphate rock and other miscellaneous analyses were made by W. C. Wheeler, whose work in association with Mr. Clarke has already been mentioned.

Special attention has been given by W. B. Hicks to the analyses of salts. Complete analyses were made of 13 brines, 3 salt samples, and 1 specimen of alunite, partial analyses of 80 samples, and qualitative examinations of about 85 samples. Mr. Hicks also carried on some experimental work on the solubility of minerals in solutions of ammonium chloride and on the evaporation of brines from Searles Lake, Cal. A paper on "Evaporation of potash brines" (Professional Paper 95–E) was submitted by him for publication by the Survey, and another on "Solubility of mixtures of sodium chloride and potas-

sium chloride in solutions of hydrochloric acid" was published in the Journal of the American Chemical Society.

A great many miscellaneous analyses, including about 30 complete analyses of rocks, brines, salts, and waters, and 78 partial analyses of brines, muds, nitrates, and waters, were made by R. K. Bailey, who also gave one hour each day to assisting geologists in testing and identifying minerals. Some improvements in the apparatus and methods used in the laboratory for analytical work were devised by Mr. Bailey.

The work of the physical laboratory has consisted chiefly of the continuation of geophysical investigations noted in previous reports. In addition to his administrative work G. F. Becker carried on studies of isostasy, in connection with which he published in the Journal of the Washington Academy of Sciences a paper on the "Mean density of fractured rocks." The experimental data for this paper were determined by A. F. Melcher, and are described by him in a "Note on the change of density of sulphur with rupture," issued in the same publication. Mr. Melcher shows that some of the principal orogenic phenomena are due to decrease in the density of rocks under confinement through the production of cracks and to increase of density through infiltration. "Isostasy and radioactivity" was the subject of a presidential address by Mr. Becker before the Geological Society of America. In this address he drew the conclusions that not more than about a quarter of the heat emitted by the earth can be due to radioactivity and that the ages of minerals as determined by radiologists are untrustworthy. In this address and in a paper in the Proceedings of the National Academy of Sciences he concludes that the outer shell of the earth beneath continental areas is in fact an imperfect heat engine, which furnishes the energy manifested in upheaval, subsidence, and orogeny.

In consultation and cooperation with Prof. P. W. Bridgman, of Harvard University, Mr. Becker furnished hollow cylinders of rock-forming minerals for use in pressure tests. These Prof. Bridgman subjects to hydrostatic pressure of many thousand kilograms per square centimeter with highly interesting but at as yet incomplete results. Acknowledgments are due the Bureau of Standards for courteous cooperation in the preparation of these cylinders.

The conduction of heat out of an unevenly heated globe was investigated by Mr. Becker in the hope of elucidating conditions in high latitudes.

Work on the construction of mathematical tables, experiments on the diffusion of solids, and measurements of the temperatures of deep wells were continued by C. E. Van Orstrand, assisted by A. F. Melcher and A. T. Harris. Progress has been made in preparing a volume of tables of the probability integral and related functions

adapted to the computation of diffusivities. An elaborate table of extended values of the exponential function and of the circular sine and cosine to radian argument is ready for publication.

In his experiments on the diffusion of solids Mr. Van Orstrand had the analytical cooperation of F. P. Dewey, of the Bureau of the Mint, United States Treasury. Some of the results of these experiments are to be published as Professional Paper 95–G, entitled "Preliminary report on the diffusion of solids." The experimental results confirm Roberts-Austen's values of the coefficients of diffusion of gold into solid lead at normal pressures and various temperatures. Preliminary experiments indicate an increase in the coefficient of diffusion with pressure. The results obtained at normal pressure from rolled plates and electroplates are remarkably consistent.

Measurements of the temperatures of two deep wells, one near Gaines, Pa., depth 5,500 feet, the other near McDonald, Pa., depth 7,000 feet, were made during the year by Mr. Van Orstrand. Determinations of the temperature of a well near Mannington, W. Va., about 3,000 feet deep, were made recently with an electrical resistance thermometer equipment specially designed by him for use in deep wells.

A paper on the "Calculation and comparison of mineral analyses," by Mr. Van Orstrand and F. E. Wright, of the Carnegie Institution, was published in the Journal of the Washington Academy of Sciences.

DIVISION OF MINERAL RESOURCES.

The scope of the work of the division of mineral resources has been the same as in recent years, the Survey having continued the policy of making the annual "Mineral Resources of the United States" more than a statistical compilation by recording and interpreting industrial progress and by treating in full the sources from which the mineral products of the country are obtained. This report thus becomes in fact, as well as in name, an annual inventory of the Nation's mineral resources.

During the last 12 years the separate chapters have been prepared in large part by geologists of the Survey who have specialized in the subjects treated, with a view to carrying out the provision of the organic act of the Survey which directs the examination of the mineral resources and products of the national domain.

Cooperation between the Geological Survey and the State surveys in collecting most of the mineral statistics continued in force in the preparation of the report for 1914. The 16 States which cooperated were Alabama, Florida, Illinois, Iowa, Maryland, Minnesota, Michigan, Missouri, New Jersey, New Mexico, North Carolina, Oregon, Pennsylvania, Virginia, Washington, and Wisconsin. The method employed obviates the duplication of a considerable amount of work

and, so far as applied, saves the producers the annoyance of preparing two sets of statistical returns.

During the fiscal year the report for 1913 was published in two parts—Part I (metals) in January and Part II (nonmetals) in February. Work on the report for 1914 was well advanced at the close of the year, 20 chapters having been completed and transmitted to the printer.

After the outbreak of the European war interest rapidly increased in the foreign supplies of mineral products needed in this country and also in domestic resources to supplant products hitherto imported and to fill war demands. A number of statements covering these subjects were immediately prepared for the press, and the division has carried on a large correspondence, furnishing to inquirers detailed information in regard to our mineral resources which could not be covered in general publications, such as locations of deposits of minerals wanted and names and addresses of producers.

Preliminary estimates of the production of arsenic, cement, coal, copper, gold and silver, iron ores, lead, petroleum, quicksilver, radium ores, rutile, tungsten ores, uranium ores, vanadium ores, western metals, and zinc in 1914, with reviews of the conditions that prevailed during the year, were given to the press in the form of special press bulletins during the later part of December, 1914, and in January, 1915. Advance statements giving the final figures covering the production of copper, lead, and zinc in 1914 have also been published.

The number of permanent employees in Washington who devote their entire time to the work of the division of mineral resources is 31, and 8 persons are employed in the offices of the division at Salt Lake City, Denver, and San Francisco. In addition to these employees, 21 members of other divisions of the Survey, chiefly geologists, devote a part of their time to the work of the division, making a total of 60 persons employed in the work.

During the year 192,673 pieces of first-class mail matter (chiefly inquiries for information needed for the reports, but including also, in increasing quantity, replies to inquiries made to the Survey for information) were sent out by the division, an increase of 2 per cent over 1914, and 65,401 pieces were received.

E. W. Parker continued as administrative head of the division and chief of the section of nonmetallic resources. On May 1 he tendered his resignation, to take a responsible position with the anthracite-coal interests. Mr. Parker's departure is a real loss to the United States Geological Survey. As the coal statistician of the Government since 1890, and as chief of the division since 1907, his contribution to the present standard of "Mineral Resources" has been large and important. He has also done valuable work in his studies of coal testing and conservation and has published in the engineering press

many papers on coal mining and production. It is fortunate that in his new field Mr. Parker will continue his work on these subjects, on which he has long been regarded an authority.

Mr. Parker's resignation became effective July 1, and H. D. McCaskey, geologist in charge of the metals section of the division, became geologist in charge of the division. Mr. McCaskey brings to his new position experience not only as a geologist of the Survey since 1907 and as section chief since 1912, but also as a mining engineer in the Philippine mining bureau from 1900 to 1903 and as chief of that bureau from 1903 to 1906.

C. E. Lesher, a geologist of the Survey, who has had extensive field and office experience and for two years and a half was vice chairman of the coal board of the land-classification board, succeeds Mr. Parker in the work on coal and coke.

On August 31 David T. Day, who for 21 years was chief of the division and for seven years was in charge of the preparation of reports on asphalt and bituminous rock, natural gas, petroleum, and platinum and allied metals, resigned. Dr. Day had taken large part in the constructive administration of the division, and his separation from the service removes another man of broad experience. John D. Northrop, a geologist of the Survey who has become familiar with the general trend of the petroleum industry by many years in geologic work in the oil fields of the United States, has taken up the work on asphalt and bituminous rock, petroleum, and natural gas.

During the year Mr. Parker prepared for publication by the Survey the report on the fuel-briquetting industry and a general review of the mineral products of the United States. The reports on the several mineral products were in charge of the following persons:

Authors of chapters in Mineral Resources.

Author.	Subject.
E. S. Bastin	Graphite.
E. F. Burchard	Cement, fluorspar and cryolite, iron ore, pig iron, and steel.
B. S. Butler	Copper (general report), copper and silver in Michigan (mines report).
A. T. Coons	Slate.
C. A. Davis (of the Bureau of Mines).	Peat.
J. S. Diller	Asbestos, chromite, talc, and soapstone.
R. B. Dole	Mineral waters.
J. P. Dunlop	Silver, copper, lead, and zinc in the Central States, except Michigan (mines report); secondary metals, metals and ores (summary report), gold, silver, copper, lead, and zinc in the Eastern States (mines report), quicksilver.
H. S. Gale	Borax, magnesite (with C. G. Yale), nitrates.
C. N. Gerry	Gold, silver, copper, lead, and zinc in Idaho and Washington (mines report).
V. C. Heikes	Gold, silver, copper, lead, and zinc in Arizona, Montana, Nevada, and Utah (mines report).
C. W. Henderson	Gold, silver, copper, lead, and zinc in Colorado, New Mexico, South Dakota, Texas, and Wyoming (mines report).
F. L. Hess	Antimony, arsenic, bismuth, cobalt, molybdenum, nickel, selenium, tantalum, tungsten, titanium, vanadium, uranium, tin.
D. F. Hewett	Manganese and manganiferous ores.
J. M. Hill	Barytes, mineral paints, platinum and allied metals, strontium ore.
F. J. Katz	Abrasives, feldspar, silica (quartz).
C. E. Lesher	Coal, and the manufacture of coke.

Authors of chapters in Mineral Resources—Continued.

Author.	Subject.
H. D. McCaskey	Gold and silver (general report), summary of mineral products, quicksilver.
Jefferson Middleton	Clay, clay-working industries, fuller's earth, sand-lime brick.
J. D. Northrop	Asphalt and bituminous rock, natural gas, petroleum.
W. C. Phalen	Bauxite and aluminum, phosphate rock, potash salts, salt and bromine, sodium salts, sulphur and pyrite.
C. E. Siebenthal	Lead, zinc, and cadmium (general reports).
D. B. Sterrett	Gems and precious stones, mica.
G. F. Loughlin	Building stone, glass sand, other sand and gravel, gypsum, lime.
C. G. Yale	Borax, magnesite (with H. S. Gale), gold, silver, copper, lead, and zinc in California and Oregon (mines report)

Mr. McCaskey also has general supervision of the offices of the division in the Western States. These offices act as Survey bureaus of information and are under the direct charge of C. W. Henderson, V. C. Heikes, and C. G. Yale, who also prepare the mines reports on gold, silver, copper, lead, and zinc in the Western States.

TOPOGRAPHIC BRANCH.

ORGANIZATION.

The organization of the topographic branch is as follows:

Chief geographer, R. B. Marshall.
Atlantic division, Frank Sutton, geographer in charge.
Central division, W. H. Herron, geographer in charge.
Rocky Mountain division, Sledge Tatum, geographer in charge.
Northwestern division, T. G. Gerdine, geographer in charge.
Pacific division, G. R. Davis, geographer in charge.
Inspectors of topography, J. H. Renshawe, geographer; W. M. Beaman and A. M. Walker, topographic engineers.

PERSONNEL.

The technical corps of the topographic branch was reduced 7 during the year by death and by resignations. With these changes the corps now includes 1 chief geographer, 9 geographers, 40 topographic engineers, 18 topographers, 41 assistant topographers, 42 junior topographers, and 8 draftsmen—a total of 159. In addition, 37 technical field assistants were employed during a whole or part of the field season. One topographic engineer, 1 topographer, 3 assistant topographers, 6 junior topographers, and 1 draftsman are on furlough. The clerical force comprises 1 senior clerk and 11 clerks of lower grades.

PUBLICATIONS.

The published work of the topographic branch for the year consists of 107 maps, which are listed on pages 36–37, and 11 book publications, namely, "Topographic instructions of the United States Geological Survey," edition of 1915, and bulletins giving results of spirit leveling

in Hawaii, Idaho, Iowa, Maryland, Michigan, Minnesota, Nebraska, Utah, Virginia, and Wisconsin. Brief summaries of these bulletins are given on page 21. Manuscripts for results of triangulation and primary traverse in the United States, 1913–1915, and of leveling in Arkansas, Georgia, Louisiana, Maine, Mississippi, New Mexico, South Dakota, Texas, and West Virginia were transmitted for publication.

ALLOTMENTS.

The total appropriations for topographic surveys for the fiscal year 1915 were:

Topographic surveys	$350,000
Surveying national forests	75,000
Statutory salaries	9,200
	434,200

The allotments of the appropriations, which were adhered to so far as practicable, were as follows:

Allotments from funds appropriated for topographic work, fiscal year 1915.

	Topographic surveys.	Surveying national forests.
Administrative expenses of Survey	$22,896	$4,500
Clerical assistance and supervision	15,670	3,210
Map editing	6,225	1,275
Purchase and repair of instruments, stationery, etc.	12,242	2,508
Millionth-scale map	20,000	.....
Field work:		
Atlantic division	66,000	.....
Central division	53,000	.....
Rocky Mountain division	63,922	19,745
Northwestern division	36,000	26,462
Pacific division	54,045	15,000
Work by land-classification board	9,000	2,500
	359,000	75,200

COOPERATION.

Cooperation has been maintained with several States, as indicated below.

Allotments made by States for cooperative work.

Alabama	$3,032.78
California (Department of Engineering)	14,000.00
Illinois	9,000.00
Iowa	1,950.00
Kentucky	10,000.00
Maine	4,000.00
Michigan	2,500.00
Minnesota	4,500.00
Missouri	5,221.74
New York	10,000.00

Ohio	$35,000.00
Oklahoma	1,000.00
Oregon	18,000.00
Pennsylvania	4,000.00
Texas	35,000.00
Vermont	2,000.00
Virginia	4,500.00
Washington	11,500.00
West Virginia	6,758.20
Wisconsin	4,000.00
Hawaii	837.35
	186,800.07

In addition to the amounts given above, the State of Virginia allotted $485 to cover one-half the cost of the compilation of the Virginia portion of the 1:1,000,000 scale map of the United States, and the city of Los Angeles, Cal., allotted $2,500 for one-half the cost of the topographic survey of the Elizabeth Lake quadrangle.

GENERAL OFFICE WORK.

Progress maps were kept up to date and new ones were compiled when necessary, the new 1:500,000 State maps were used when available, and results of computations for vertical and horizontal control work were copied and catalogued.

The computations of control data were made principally by D. H. Baldwin, T. M. Bannon, C. E. Cooke, J. R. Ellis, G. T. Hawkins, Oscar Jones, C. B. Kendall, F. J. McMaugh, A. C. Roberts, J. H. Wilson, Fred McLaughlin, J. F. McBeth, and J. I. Gayetty under the immediate supervision of E. M. Douglas, geographer. Computing by L. F. Biggs and C. F. Urquhart was done in the Sacramento office. S. S. Gannett, geographer, was engaged in preparing manuscript and compiling data for the bulletins submitted for publication, in miscellaneous computations, and in furnishing triangulation and leveling data for field and office use.

J. H. Renshawe was engaged during a portion of the time in preparing for the Secretary of the Interior colored relief maps of Mount Rainier, Mesa Verde, and Rocky Mountain national parks. He also prepared a colored relief map of San Francisco and vicinity, a relief map of Alaska for the division of Alaskan mineral resources, and a small model to show the Survey's work for use in preparing a large model for the exhibition at San Francisco.

In the preparation of the special topographic maps used in the four transcontinental guidebooks the available Survey atlas sheets were used, and where such sheets were not available the data were filled in on field sheets on a scale of 5 miles to the inch. The different railroads assisted in every way possible, supplying all available profile

and alignment data and rendering other valuable assistance. The maps were published on a scale of 1:500,000, or about 8 miles to the inch, and cover routes as follows:

The Northern Pacific Route, over the Northern Pacific Railway from St. Paul, Minn., to Seattle, Wash., with a branch from Livingston to Gardiner, Mont., at the north entrance to Yellowstone National Park (Bulletin 611).

The Overland Route, over the Union Pacific and Southern Pacific railroads from Omaha, Nebr., to San Francisco, with a branch from Ogden, Utah, over the Oregon Short Line, to the west entrance to Yellowstone National Park (Bulletin 612).

The Santa Fe Route, over the Atchison, Topeka & Santa Fe Railway from Kansas City, Mo., to Los Angeles, Cal., with a branch from Williams, Ariz., to the Grand Canyon (Bulletin 613).

The Shasta Route, over the Northern Pacific and Southern Pacific railroads from Seattle, Wash., to San Francisco, and the Coast Line, over the Southern Pacific Railroad from Los Angeles to San Francisco (Bulletin 614).

SUMMARY OF RESULTS.

The condition of topographic surveys to June 30, 1915, distinguished as to scale, etc., is shown on the map facing page 538.

As shown in the following tables, the total new area mapped was 20,508 square miles, making the total area surveyed to date in the United States 1,218,290 square miles, or 40.2 per cent of the entire country. In addition, 3,048 square miles of resurvey was completed, making the total area of surveys during the year 23,556 square miles.

In connection with these surveys, 6,952 linear miles of primary and precise levels were run, making 254,359 miles of primary and precise levels run since the authorization of this work by Congress in 1896. In the course of this work, 1,747 permanent bench marks were established. In addition, 498 linear miles of river surveys were run.

Triangulation stations to the number of 252 were occupied and 158 were permanently marked. Primary traverse lines aggregating 2,105 miles were run, in connection with which 356 permanent marks were set. In the course of this work 32,400 square miles were covered by primary control.

The area covered by topographic surveys in Alaska during the fiscal year, as reported in detail on page 93, was 10,910 square miles.

Topographic surveys were also carried on in Hawaii, the area mapped during the fiscal year being 19 square miles, for publication on the scale of 1:31,680, making the total area surveyed to date in Hawaii 1,393 square miles.

The average cost per square mile of the work done was $22, the cost ranging from a little less than $4 in the Elizabeth Lake (Cal.) quadrangle to over $227 on the Sabine River project, Texas. Sixty per cent of the funds was expended in the public-land States.

Present condition of topographic surveys of the United States and new areas surveyed July 1, 1914, to June 30, 1915.

	New area mapped July 1, 1914, to June 30, 1915.	Total area mapped to June 30, 1915.	Percentage of total area of State mapped to June 30, 1915.
	Sq. miles.	*Sq. miles.*	
Alabama	440	19,192	37
Arizona	932	68,996	61
Arkansas	.....	21,380	40
California	3,592	114,708	72
Colorado	1,439	48,783	47
Connecticut	.....	4,965	100
Delaware	.....	1,202	51
District of Columbia	.....	70	100
Florida	259	2,339	4
Georgia	.....	17,337	29
Idaho	687	26,185	31
Illinois	539	14,551	26
Indiana	191	3,441	9
Iowa	119	11,652	21
Kansas	.....	64,159	78
Kentucky	.....	17,973	44
Louisiana	8	8,319	17
Maine	151	9,361	28
Maryland	.....	12,327	100
Massachusetts	.....	8,266	100
Michigan	273	6,018	10
Minnesota	454	6,541	8
Mississippi	237	2,126	4
Missouri	544	36,710	53
Montana	557	57,163	39
Nebraska	.....	26,524	34
Nevada	53	51,115	46
New Hampshire	.....	3,380	36
New Jersey	.....	8,224	100
New Mexico	1,315	37,247	30
New York	613	43,553	89
North Carolina	82	18,390	35
North Dakota	.....	9,716	14
Ohio	2,818	40,018	97
Oklahoma	83	39,851	57
Oregon	1,771	23,406	24
Pennsylvania	262	24,908	55
Rhode Island	.....	1,248	100
South Carolina	.....	5,640	18
South Dakota	.....	18,594	24
Tennessee	.....	21,153	50
Texas	99	67,782	25
Utah	507	68,797	81
Vermont	224	4,190	44
Virginia	.....	29,980	70
Washington	1,432	26,033	38
West Virginia	.....	24,170	100
Wisconsin	270	12,203	21
Wyoming	557	28,404	29
	20,508	1,218,290	40.2
Hawaii	19	1,393	22

ATLANTIC DIVISION.

FIELD WORK.

Summary.—During the season topographic mapping was carried on in Alabama, Florida, Georgia, Maine, Mississippi, New York, North Carolina, Pennsylvania, Tennessee, Vermont, Virginia, and West Virginia, and in a small area in Arkansas. This work comprised the completion of the survey of 11 quadrangles and of the resurvey of 5 quadrangles, in addition to which 7 quadrangles were partly surveyed and 7 were partly resurveyed. The total new area

mapped was 2,276 square miles, for publication on the scale of 1 : 62,500. The area resurveyed was 1,083 square miles, for publication on the scale of 1 : 62,500. The map of one quadrangle was partly revised, the area covered by this revision being 13 square miles. In connection with this work 1,268 miles of primary levels were run and 332 permanent bench marks were established.

Primary triangulation and primary traverse were carried on at different times by seven parties, the work being distributed over portions of Louisiana, Maryland, New York, and West Virginia. The total area covered by this primary control was about 2,200 square miles—1,000 square miles by primary traverse, 336 miles being run and 36 permanent marks set. Twenty-four triangulation stations were occupied and 4 were permanently marked. This work made control available in 17 quadrangles.

Topographic surveys in Atlantic division from July 1, 1914, to June 30, 1915.

State.	Contour interval.	For publication on scale of 1 : 62,500.		Total area surveyed.	Primary levels.		Primary traverse.		Triangulation.	
		New.	Resurvey.		Distance run.	Bench marks.	Distance run.	Permanent marks.	Stations occupied.	Stations marked.
	Feet.	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Miles.*		*Miles.*			
Alabama	20	440	99	539	144	36	.....	.....	.....	.....
Arkansas	.....	.....	.....	.....	42	3	.....	.....	.....	.....
Florida	20	259	.....	259	.....	.....	.....	.....	.....	.....
Georgia	50	.....	38	38	.....	.....	.....	.....	.....	.....
Louisiana	10	8	.....	8	55	13	86	12	.....	.....
Maine	20	151	163	314	15	3	.....	.....	.....	.....
Maryland	.....	.....	.....	.....	.....	.....	34	2	.....	.....
Mississippi	10	237	.....	237	116	34	.....	.....	.....	.....
New York	20	613	.....	613	443	116	117	12	9	4
North Carolina	20	82	.....	82	.....	.....	.....	.....	.....	.....
Pennsylvania	20	262	.....	262	114	44	.....	.....	.....	.....
Tennessee	.....	.....	.....	.....	56	5	.....	.....	.....	.....
Vermont	20	224	.....	224	67	17	.....	.....	.....	.....
Virginia	50	.....	317	317	101	27	.....	.....	.....	.....
West Virginia	20	.....	466	466	115	34	99	10	15	.....
		2,276	1,083	3,359	1,268	332	336	36	24	4

Alabama.—As stated in the previous annual report, the State geologist of Alabama allotted $10,000 to cover the cost of unfinished cooperative work done in 1911–12, when under a cooperative agreement to spend $10,000 each $7,024.93 was expended by the Federal Survey and nothing by the State, whose funds were not available. During the year, after $3,032.78 had been expended, State cooperation ceased and the work was completed with Federal funds amounting to $5,932.15. The survey of the Muscle Shoals and Center Star quadrangles in Colbert, Lauderdale, and Lawrence counties, was completed, and that of the Gravelly Springs quadrangle, in Lauderdale County, was begun by C. E. Cooke, W. H. S. Morey, T. F. Slaughter, C. S. Wells, F. W. Crisp, and R. H. Kilmer, the area mapped being

440 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet. For the control of the Center Star quadrangle Mr. Kilmer ran 66 miles of primary levels and established 17 permanent bench marks.

In addition to the cooperative work the resurvey of the Weogufka quadrangle in Coosa, Shelby, and Talladega counties was commenced by Duncan Hannegan, W. H. Griffin, W. H. S. Morey, J. B. Metcalfe, jr., C. S. Wells, and C. W. Arnold, the area mapped being 99 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet. For the control of this area H. S. Senseney ran 78 miles of primary levels and established 19 permanent bench marks.

Arkansas.—(See Tennessee-Arkansas, p. 535.)

District of Columbia-Maryland-Virginia.—During the year the culture on the map of Washington and vicinity was revised in the field. In connection with this work C. B. Kendall and C. A. Ecklund ran 34 miles of primary traverse and set two permanent marks.

Florida.—The survey of the Interlachen quadrangle, in Marion and Putnam counties, was completed by W. H. Griffin, J. B. Metcalfe, jr., and C. W. Arnold, the area mapped being 259 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet.

Georgia.—The resurvey of the Talking Rock quadrangle, in Gilmer, Gordon, Murray, and Pickens counties, was completed by E. I. Ireland, K. W. Trimble, and H. S. Senseney, the area mapped being 38 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 50 feet.

Louisiana.—For the control of the Blanchard quadrangle, in Bossier and Caddo parishes, C. S. Wells and F. W. Crisp ran 86 miles of primary traverse and set 12 permanent marks and also ran 55 miles of primary levels and established 13 permanent bench marks. (See also Mississippi-Louisiana, p. 534.)

Maine.—For the continuation of cooperative topographic surveys in Maine the State Water Storage Commission allotted $4,000, which was met by the United States Geological Survey with an equal amount. The survey of the Liberty quadrangle, in Kennebec, Knox, Lincoln, and Waldo counties, was completed, and that of the Belfast quadrangle, in Knox and Waldo counties, was begun by W. H. Griffin, Duncan Hannegan, K. E. Schlachter, C. H. Davey, and E. W. Bowler, the total area mapped being 151 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet. For the control of the Belfast quadrangle Mr. Schlachter ran 15 miles of primary levels and established 3 permanent marks.

In addition to the cooperative work in Maine, the resurvey of the Portland and Casco Bay quadrangles, in Cumberland and York

counties, was completed by Hersey Munroe, R. A. Kiger, and K. F. Maxcy, the area mapped being 163 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet.

Mississippi-Louisiana.—The survey of the Vicksburg quadrangle, in Issaquena and Warren counties, Miss., and Madison Parish, La., was continued by C. E. Cooke, W. H. S. Morey, C. S. Wells, and F. W. Crisp, the area mapped being 245 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 10 feet. Of this area 8 square miles is in Louisiana. For the control of this area and of the Natchez quadrangle, in Adams and Jefferson counties, Miss., and Concordia Parish, La., H. S. Senseney and R. H. Kilmer ran 116 miles of primary levels and established 34 permanent bench marks.

New York.—The State engineer and surveyor of New York allotted $10,000 for the continuation of cooperative topographic surveys in that State, and the United States Geological Survey allotted an equal amount. The survey of the Canaseraga and Malone quadrangles, in Allegany, Franklin, and Livingston counties, was completed, and that of the Edwards, Hornell, and Moira quadrangles, in Allegany, Franklin, Livingston, Steuben, and St. Lawrence counties, was begun by G. S. Smith, Hersey Munroe, Robert Muldrow, R. C. McKinney, J. M. Whitman, A. P. Meade, jr., T. F. Slaughter, H. L. Dodge, and C. H. Davey, the area mapped being 613 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet. In connection with the mapping of these areas and of the Andes, Oswegatchie, Long Eddy, Walton, Sidney, and Oneonta quadrangles, in Delaware, Chenango, Herkimer, Lewis, Otsego, and St. Lawrence counties, A. P. Meade, jr., K. E. Schlachter, H. S. Senseney, A. J. Kavanagh, and F. L. Shalibo ran 422 miles of primary levels and established 114 permanent bench marks. For the control of the Malone, Edwards, and Moira quadrangles G. T. Hawkins ran 117 miles of primary traverse and set 12 permanent marks, and for the control of the Oneonta and Sidney quadrangles, in Chenango, Delaware, and Otsego counties, Mr. Hawkins occupied 6 triangulation stations and marked 4.

In addition to the cooperative work, Mr. Hawkins and F. J. McMaugh occupied 3 triangulation stations in the John Boyd Thatcher Park, in Albany County, and ran 21 miles of primary levels and established 2 permanent bench marks in the Altamont Park, Albany County.

North Carolina.—The survey of the Gastonia quadrangle, in Gaston, Lincoln, and Mecklenberg counties, was completed by G. S. Smith, J. M. Whitman, J. H. Le Feaver, and Roscoe Reeves, the area mapped being 82 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet.

Pennsylvania.—The Topographic and Geologic Survey Commission of Pennsylvania allotted $4,000 for the continuation of the cooperative topographic survey of the State, and the United States Geological Survey allotted an equal amount. The survey of the Windber and Windgap quadrangles, in Bedford, Cambria, Carbon, Monroe, Northampton, and Somerset counties, was completed by Robert Muldrow, Oscar Jones, R. A. Kiger, J. B. Metcalfe, jr., E. D. Monroe, and C. E. Mills, the area mapped being 262 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet. For the control of the Windgap quadrangle and of the Stahlstown quadrangle, in Fayette, Somerset, and Westmoreland counties, C. E. Mills ran 114 miles of primary levels and established 44 permanent bench marks.

In addition to the cooperative work the revision of part of the map of the Houtzdale quadrangle, in Clearfield and Center counties, was commenced by J. I. Gayetty, the area covered being 13 square miles.

Tennessee-Arkansas.—For the control of the Memphis quadrangle, in Shelby County, Tenn., and Crittenden County, Ark., F. W. Crisp and Kostka Mudd ran 98 miles of primary traverse and set 8 permanent marks, of which 42 miles and 3 marks were in Arkansas.

Vermont.—For the continuation of cooperative topographic surveys in the State of Vermont the governor allotted $2,000 and the United States Geological Survey allotted an equal amount. The survey of the St. Albans quadrangle, in Franklin and Grand Isle counties, was completed by Duncan Hannegan and J. F. McBeth, the area mapped being 224 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet. In connection with this work K. E. Schlachter ran 67 miles of primary levels and established 17 permanent bench marks. The cooperative funds being insufficient to cover the completion of the St. Albans sheet, the additional expenses were borne by the Federal Survey.

Virginia.—For the continuation of cooperative topographic surveys in Virginia the State geologist allotted $4,500 and the United States Geological Survey allotted an equal amount. The resurvey of the Bucu quadrangle and of the Virginia portions of the Hurley and Iaeger quadrangles, in Buchanan, Dickinson, and Russell counties, was completed, and that of the Richlands quadrangle, in Buchanan, Russell, and Tazewell counties, was begun by J. I. Gayetty, C. W. Arnold, F. W. Farnsworth, and Kostka Mudd, the area mapped being 316 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 50 feet. For the control of these areas Mr. Mudd ran 101 miles of primary levels and established 27 permanent bench marks. (See also West Virginia, below.)

West Virginia.—In the continuation of cooperative topographic surveys in West Virginia the State geologist expended $6,758.20 and

the United States Geological Survey $1,507.49. A resurvey of the West Virginia portions of the Martinsburg, Berryville, and Gerrardstown quadrangles and of the Morgan County portion of the Capon Bridge quadrangle was completed by E. I. Ireland, Hersey Munroe, T. F. Slaughter, K. W. Trimble, and C. W. Arnold, the area mapped being 467 square miles, for publication of the scale of 1 : 62,500, with a contour interval of 20 feet. Of this area 1 square mile is in Virginia. This work completed the mapping of Berkeley, Jefferson, and Morgan counties on the scale of 1 : 62,500. In connection with this work G. T. Hawkins and J. B. Metcalfe, jr., ran 99 miles of primary traverse and set 10 permanent marks, and K. W. Trimble and H. S. Senseney ran 115 miles of primary levels and established 34 permanent bench marks.

For the control of portions of the Webster Springs, Cowen, Richwood, Winona, and Summersville quadrangles Oscar Jones occupied 15 triangulation stations. This work was done to control those portions of Nicholas and Webster counties not yet mapped on the scale of 1 : 62,500.

OFFICE WORK.

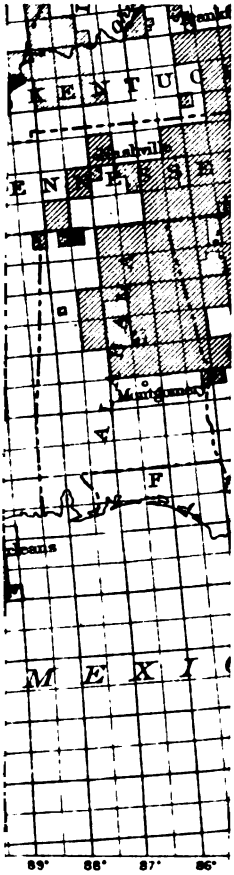
The drafting of the following sheets was completed: Muscle Shoals and Center Star, Ala.; Talking Rock, Ga.; Casco Bay, Liberty, and Portland, Maine; Canaseraga, N. Y.; Belhaven, Gastonia, and Kinston, N. C.; Windber and Windgap, Pa.; Murfreesboro, Tenn.; St. Albans, Vt.; Bucu, Va.; Iaeger, Va.-W. Va.; Winona, W. Va.

Progress in the drafting of additional sheets was made as follows: Hornell, N. Y., 20 per cent; Malone, N. Y., 50 per cent; Hurley, Va.-Ky., 67 per cent; Berryville, W. Va.-Va., 26 per cent; Capon Bridge, W. Va.-Va., 15 per cent; Gerrardstown, W. Va.-Va., 72 per cent; Martinsburg, W. Va.-Va.-Md., 91 per cent.

The following computations and adjustments were made:

Primary-level circuits were adjusted for the Center Star (Ala.), Talking Rock (Ga.), Blanchard (La.), Belfast, Liberty, and Portland (Me.), Vicksburg (Miss.), Canaseraga, Edwards, Hornell, and Oswegatchie (N. Y.), Belhaven, Bunyon, and Chocowinity (N. C.), Stahlstown, and Windgap (Pa.), Murfreesboro (Tenn.), Franklin Pond and St. Albans (Vt.), Bucu, Hurley, Iaeger, and Richlands (Va.) quadrangles.

Geographic positions were computed for the Weogufka (Ala.), Blanchard and Bossier (La.), Washington (D. C.-Md.), Natchez and Vicksburg (Miss.), Berne, Edwards, Malone, Moira, Oneonta, Oswegatchie, Sidney, and Stark (N. Y.), Belhaven, Bunyon, and Plymouth (N. C.), Berryville, Gerrardstown, and Martinsburg (W. Va.) quadrangles.



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CENTRAL DIVISION.

FIELD WORK.

Summary.—During the season topographic mapping was carried on in Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. The work comprised the completion of the survey of 25 quadrangles and of the resurvey of 7 quadrangles, in addition to which 19 quadrangles were partly surveyed and 3 were partly resurveyed. The total new area mapped was 5,208 square miles, for publication on the scale of 1 : 62,500; and the area resurveyed was 935 square miles, for publication on the scale of 1 : 62,500. In connection with this work 1,971 miles of primary levels were run and 454 permanent bench marks were established.

Primary traverse was carried on at different times by six parties, the work being distributed over portions of Illinois, Iowa, Kentucky, Michigan, Minnesota, and Wisconsin. The total area covered by the primary control was about 4,000 square miles, of which 3,600 square miles was controlled by primary traverse, 958 linear miles of primary traverse being run and 84 permanent marks set. Five triangulation stations were occupied and 4 marked. The result of this work was to make control available in 50 quadrangles.

Topographic surveys in central division from July 1, 1914, to June 30, 1915.

State.	Contour interval.	For publication on scale of 1 : 62,500.		Total area surveyed.	Primary levels.		Primary traverse.		Triangulation.	
		New.	Resurvey.		Distance run.	Bench marks.	Distance run.	Permanent marks.	Stations occupied.	Stations marked.
	Feet.	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Miles.*		*Miles.*			
Illinois	20	539	.....	539	461	135	373	31	.....	.....
Indiana	20	191	.....	191	61	13	.....	.....	.....	.....
Iowa	20	119	.....	119	.....	.....	82	13	.....	.....
Kentucky	50	.....	913	913	168	47	89	6	5	4
Michigan	5, 20	273	.....	273	.....	.....	151	14	.....	.....
Minnesota	10	454	.....	454	11	2	12	1	.....	.....
Missouri	20	544	22	566	300	86	.....	.....	.....	.....
Ohio	10, 20	2,818	.....	2,818	796	129	.....	.....	.....	.....
Wisconsin	20	270	.....	270	174	42	251	19	.....	.....
		5,208	935	6,143	1,971	454	958	84	5	4

Illinois.—The governor of Illinois allotted $9,000 for the continuation of cooperative topographic surveys in Illinois and the United States Geological Survey allotted an equal amount. The survey of the Coulterville and Equality quadrangles and of the Illinois portions of the Shawneetown, Birds, Fords Ferry, and Golconda quadrangles in Perry, Randolph, St. Clair, Washington, Gallatin, Hardin, Pope, Saline, Crawford, and Lawrence counties was completed, and that of the Brownfield quadrangle, in Johnson, Massac, and Pope counties,

was begun by C. W. Goodlove, Fred Graff, jr., Gilbert Young, J. A. Duck, R. G. Clinite, R. M. Herrington, and W. S. Gehres, the total area mapped being 539 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet. For the control of the Brownfield, Morris, Birds, Good Hope, Paducah, Woodhull, Quincy, Orion, Alexis, Augusta, Monmouth, Meredosia, La Harpe, Mount Sterling, Camp Point, Griggsville, Pittsfield, and Barry quadrangles, in Johnson, Massac, Pope, Grundy, Kendall, Crawford, Lawrence, McDonough, Warren, Henry, Knox, Mercer, Adams, Pike, Rock Island, Brown, Schuyler, Hancock, Cass, Fulton, Henderson, Morgan, Scott, and Greene counties, S. R. Archer, E. C. Bibbee, G. W. Lucas, and R. G. Clinite ran 461 miles of primary levels and established 135 permanent bench marks. For the control of the Augusta, Beardstown, Good Hope, Lomax, Oquaka, Monmouth, Meredosia, La Harpe, Rushville, Kirkland, Wilmington, Sycamore, Shabbona, Quincy, Mount Sterling, Morris, Liberty, Earlville, Dwight, Camp Point, and Yorkville quadrangles, in Adams, Brown, Schuyler, Hancock, Cass, Fulton, McDonough, Warren, Henderson, Pike, Scott, Morgan, Ogle, Dekalb, Boone, Winnebago, Will, Kankakee, Kane, Lee, Grundy, Kendall, La Salle, and Livingston counties, E. L. McNair ran 373 miles of primary traverse and set 31 permanent marks.

Indiana.—The mapping of the Indiana portions of the Uniontown and Henderson quadrangles, in Posey and Vanderburg counties, was completed by C. W. Goodlove, W. S. Gehres, and R. M. Herrington, the area mapped being 148 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet. For the control of these areas S. R. Archer and Marvin Lee ran 61 miles of primary levels and established 13 permanent bench marks. The survey of the Indiana portion of the Birds quadrangle, in Knox and Sullivan counties, was completed by Fred Graff, jr., the area mapped being 30 square miles, for publication on the same scale as the Illinois portion. The mapping of the Indiana portion of the Three Rivers quadrangle was completed by L. L. Lee and H. E. Burney, the area mapped being 13 square miles, for publication on the same scale as the Michigan portion.

Iowa.—The State geologist allotted $1,750 for the continuation of cooperative topographic surveys in Iowa and the Federal Survey allotted an equal amount. The survey of the Boone quadrangle, in Boone, Hamilton, and Webster counties, was completed, and that of the Chariton quadrangle, in Lucas, Marion, and Warren counties, was begun by W. L. Miller, the area mapped being 119 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet. For the control of the Chariton quadrangle, and also of the Melrose, Attica, Humeston, New Virginia, and Albia quadrangles,

in Lucas, Marion, Warren, Appanoose, Wayne, Clarke, Monroe, and Mahaska counties, E. L. McNair ran 82 miles of primary traverse and set 13 permanent marks.

Kentucky.—The Kentucky Geological Survey allotted $10,000 for the continuation of cooperative topographic surveys in Kentucky and the United States Geological Survey allotted an equal amount. The resurvey of the Laynesville and Inez quadrangles, in Floyd, Johnson, Lawrence, Martin, and Pike counties, and of the Kentucky portion of the Naugatuck, Hurley, Matewan, and Williamson quadrangles, in Lawrence, Pike, and Martin counties, was completed, and that of the Kentucky portion of the Regina quadrangle, in Pike County, was begun by J. R. Eakin, E. I. Ireland, C. P. McKinley, J. M. Rawls, Howard Clark, S. A. Judson, W. A. Reiter, F. W. Farnsworth, G. W. Lucas, W. S. Gehres, Klett McKinley, and Sylvan Price, the area mapped being 913 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 50 feet. For the control of the Laynesville, Hurley, Matewan, Naugatuck, Regina, and Williamson quadrangles S. R. Archer and Mr. Lucas ran 168 miles of primary levels and established 47 permanent bench marks. For the control of the Kuttawa quadrangle and of the Kentucky portions of the Fords Ferry, Golconda, and Smithland quadrangles, in Crittenden, Livingston, Marshall, Cracken, and Trigg counties, J. H. Wilson ran 89 miles of primary traverse and set 6 permanent marks, and for the control of the Paintsville and Goodloe quadrangles, in Breathitt, Magoffin, Johnson, Morgan, Lawrence, and Floyd counties, C. L. Nelson occupied 5 triangulation stations and marked 4.

Michigan.—For the continuation of cooperative topographic surveys in Michigan the State geologist allotted $2,500 and the United States Geological Survey allotted an equal amount. The survey of the St. Charles quadrangle and of the Michigan portion of the Three Rivers quadrangle, in Midland, Saginaw, and St. Joseph counties, was completed by C. L. Sadler, L. L. Lee, and H. E. Burney, the area mapped being 273 square miles, for publication on the scale of 1 : 62,500, with contour intervals of 5 and 20 feet. For the control of the Perrington, Elsie, Chesaning, and Saginaw quadrangles, in Bay, Clinton, Gratiot, Saginaw, and Shiawassee counties, J. H. Wilson ran 151 miles of primary traverse and set 14 permanent marks.

Minnesota.—The State drainage engineer of Minnesota allotted $4,500 for the continuation of cooperative topographic surveys in that State and the United States Geological Survey allotted an equal amount. The survey of the Aitkin, Pelican Rapids, and Wealthwood quadrangles, in Aitkin, Becker, Clay, and Ottertail counties, was

completed, and that of the Brainerd quadrangle, in Crow Wing County, was begun by F. B. Barrett, J. H. Wilson, E. L. Hain, and L. B. Roberts, the area mapped being 454 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 10 feet. (See also Wisconsin, p. 541.)

Missouri.—For the continuation of cooperative topographic surveys in Missouri the State geologist allotted $5,221.74 and the United States Geological Survey allotted an equal amount. The survey of the Neosho and Eminence quadrangles, in McDonald, Newton, and Shannon counties, was completed by C. G. Anderson, R. L. Harrison, F. W. Hughes, J. M. Rawls, G. W. Lucas, R. H. Randall, W. F. Hicks, and R. M. Herrington, the area mapped being 477 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet. For the control of these areas and of the Bandyville, Low Wossie, Upalika, Puxico, Grandin, Greenbrier, Hendrickson, Advance, Cape Girardeau, and Morley quadrangles, in Oregon, Shannon, Carter, Ripley, Butler, Wayne, Stoddard, Bollinger, Cape Girardeau, and Scott counties, G. W. Lucas and E. C. Bibbee ran 300 miles of primary levels and established 86 permanent bench marks. The resurvey of the Sturgeon quadrangle, in Audrain, Boone, Howard, and Randolph counties, was completed by C. G. Anderson and W. L. Miller, the area mapped being 22 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet.

In addition to the cooperative work, the mapping of the Missouri portion of the Kimmswick quadrangle, in Jefferson and St. Louis counties, was completed by F. W. Hughes, R. H. Randall, and W. F. Hicks, the area mapped being 67 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet.

Ohio.—For the continuation of cooperative topographic surveys in Ohio the governor allotted $35,000 and the United States Geological Survey allotted $10,000. The survey of the Mechanicsburg, Greenfield, Milford Center, Octa, Xenia, Sabina, Morrow, Hillsboro, Sardinia, and Batavia quadrangles and of the Ohio portions of the Lawrenceburg, Richmond, Harrison, Lynn, and Portland quadrangles, in Adams, Brown, Butler, Champaign, Clark, Darke, Highland, Hamilton, Preble, Logan, Madison, Mercer, Union, Fayette, Ross, Clinton, Greene, Warren, and Clermont counties, was completed, and that of the West Union, Piketon, and Bainbridge quadrangles and of the Ohio portions of the Georgetown and Liberty quadrangles, in Adams, Brown, Butler, Preble, Highland, Pike, and Ross counties was begun, the total area mapped being 2,818 square miles for publication on the scale of 1 : 62,500, with contour intervals of 10 and 20 feet. This work was done by J. H. Jennings, A. B. Searle, Gilbert Young, Fred Graff, jr., R. L. Harrison, E. L. Hain, J. A. Duck, J. H. Wilson, F. B. Barrett, M. A. Roudabush, S. L. Parker,

E. C. Burt, R. M. Wilcoxon, Howard Clark, W. A. Reiter, H. E. Burney, W. S. Gehres, and S. A. Judson. For the control of these areas and of the Piketon and Roxabell quadrangles and the Ohio portions of the Bethel, Maysville, Morningview, and Liberty quadrangles, in Pike, Butler, Ross, Brown, Preble, Hamilton and Clermont counties, F. L. Whaley, J. M. Perkins, Mr. Parker, S. R. Archer, and E. C. Bibbee ran 796 miles of permanent levels and established 129 permanent bench marks.

Wisconsin.—For the beginning of cooperative topographic surveys in Wisconsin the State geologist allotted $4,000 and the United States Geological Survey allotted an equal amount. The survey of the Neshkoro and Ripon quadrangles, in Fond du Lac, Green Lake, Marquette, Winnebago, and Waushara counties and of the Wisconsin portion of the Old Superior quadrangle, in Douglas County, was begun by L. L. Lee, L. B. Roberts, and R. M. Herrington, the area mapped being 198 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet. For the control of these areas E. C. Bibbee and J. M. Perkins ran 173 miles of primary levels and established 44 permanent bench marks, of which 11 miles and 2 marks were in Minnesota. For the control of these areas and of the Fisk, Chaffey, Ripon, Rockmont, Oshkosh, Carlton, Poy Sippi, Montello, Spring Lake, Portage, Cambria, and Fox Lake quadrangles in Fond du Lac, Portage, Columbia, Dodge, Winnebago Douglas, Green Lake, Marquette, Waushara, Outagamie, and Waupaca counties, Wis., and Carlton and St. Louis counties, Minn., E. L. McNair ran 263 miles of primary traverse and set 20 permanent marks, of which 12 miles and 1 mark were in Minnesota.

In addition to the cooperative work the survey of the Wilton quadrangle in Monroe County was completed by R. T. Evans, O. H. Nelson, D. H. Watson, and J. M. Perkins, the area mapped being 72 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 20 feet. For the control of this area Mr. Perkins ran 12 miles of primary levels.

OFFICE WORK.

The drafting of the following sheets was completed: Birds, Ill.-Ind.; Coulterville and Equality, Ill.; Shawneetown, Ill.-Ky.; Henderson and Uniontown, Ind.-Ky.; Boone, Iowa; Inez, Laynesville, and Virgie, Ky.; St. Charles, Mich.; Three Rivers, Mich.-Ind.; Aitkin, Pelican Rapids, and Wealthwood, Minn.; Kimmswick, Mo.-Ill.: Neosho and Sturgeon, Mo.; Batavia, Greenfield, Mechanicsburg, Milford Center, Morrow, Octa, Sabina, St. Paris, and Xenia, Ohio; Wilton, Wis.

Progress in the drafting of additional sheets was made as follows: Brownfield, Ill.-Ky., 10 per cent; Fords Ferry, Ill.-Ky., 9 per cent; Golconda, Ill.-Ky., 32 per cent; Chariton, Iowa, 25 per cent;

Brainerd, Minn., 30 per cent; Eminence, Mo., 70 per cent; Hillsboro, Ohio, 70 per cent; Sardinia, Ohio, 55 per cent; Old Superior, Wis.-Minn., 35 per cent.

The following computations and adjustments were made:

Primary-level circuits were adjusted for the Birds, Brownfield, Camp Point, Equality, Good Hope, La Harpe, Lomax, Meredosia, Morris, Paducah, Pittsfield, Quincy, Shawneetown, and Sparta (Ill.), Alzey and Evansville (Ind.), Hurley, Inez, Laynesville, and Matewan (Ky.), Advance, Eminence, Neosho, Salem, and Sinkin (Mo.), Bainbridge, Batavia, Bethel, Hillsboro, Lawrenceburg, Morrow, Piketon, Portland, Richmond, Roxabell, and Sabina (Ohio), Old Superior and Wilton (Wis.) quadrangles.

Geographic positions were computed for the Augusta, Beardstown, Camp Point, Good Hope, La Harpe, Liberty, Lomax, Meredosia, Monmouth, Morris, Mount Sterling, Oquawka, Quincy, Rushville, and Shabbona (Ill.), Attica and Chariton (Iowa), Chesaning, Elsie, and Perrinton (Mich.), Eminence, Knobnoster, Neosho, Odessa, and Warrensburg (Mo.), Cambria, Fisk, Fox Lake, Montello, Neshkoro, Old Superior, Oshkosh, Portage, Poy Sippi, Ripon, and Spring Lake (Wis.) quadrangles.

ROCKY MOUNTAIN DIVISION.

FIELD WORK.

Summary.—During the season topographic mapping was carried on in Colorado, Montana, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming, and in a small area in Minnesota. This work comprised the completion of the survey of 10 quadrangles and 1 special area and the resurvey of 2 quadrangles and 1 special area, in addition to which 10 quadrangles and 2 special areas were partly surveyed and 1 special area was partly resurveyed. The total new area mapped was 3,855 square miles, 3,247 square miles for publication on the scale of 1 : 125,000, 429 square miles for publication on the scale of 1 : 62,500, 149 square miles for publication on scale of 1 : 31,680, and 30 square miles for publication on the scale of 1 : 12,000. The total area resurveyed was 526 square miles, 484 square miles for publication on the scale of 1 : 62,500, and 42 square miles for publication on the scale of 1 : 24,000. In addition the map of 1 quadrangle was revised and that of 1 quadrangle was partly revised, the area covered being 1,215 square miles. In connection with this work 2,179 miles of primary levels were run and 592 permanent bench marks were established.

Primary traverse and primary triangulation were carried on at different times by 7 parties, the work extending over portions of Colorado, New Mexico, Oklahoma, Texas, and Wyoming. The total area covered by this primary control was about 15,400 square miles,

of which 1,440 square miles was controlled by primary traverse, 662 miles being run and 196 permanent marks set. Ninety triangulation stations were occupied and 56 marked. This work made control available in 60 quadrangles.

Topographic surveys in Rocky Mountain division from July 1, 1914, to June 30, 1915.

State.	Contour interval.	For publication on scale of—					
		1:125,000.	1:62,500.		1:31,680.	1:24,000.	1:12,000.
		New.	New.	Re-survey.	New.	Re-survey.	New.
	Feet.	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*
Colorado	5,100	1,338			101		
Montana	20,100	389	50				
New Mexico	25,50,100	1,238				42	
Oklahoma	25		83	484			
Texas	2,5,25		21		48		30
Wyoming	25,50	282	275				
		3,247	429	484	149	42	30

State.	Total area surveyed.	Primary levels.		Primary traverse.		Triangulation.	
		Distance run.	Bench marks.	Distance run.	Permanent marks.	Stations occupied.	Stations marked.
	Sq. mi.	*Miles.*		*Miles.*			
Colorado	1,439	552	152			58	35
Montana	439						
Nebraska		13	2				
New Mexico	1,280	689	180			10	8
Oklahoma	567	160	48	94	13		
South Dakota		3	2				
Texas	99	588	175	568	183	18	12
Wyoming	557	142	25			1	
Arizona		23	6				
Minnesota		9	2				
	4,381	2,179	592	662	196	87	55

Arizona.—(See New Mexico, p. 545.)

Colorado.—The mapping of the Craig quadrangle, in Moffat County, and the San Luis Lake special area, in Alamosa County, was completed, and that of the Naturita quadrangle, in Montrose and San Miguel counties, was begun by C. L. Nelson, C. W. Rowell, J. H. Wilke, C. T. Moore, R. W. Berry, E. P. Davis, Basil Duke, and R. R. Monbeck, the area mapped being 736 square miles, 635 square miles for publication on the scale of 1:125,000, with a contour interval of 100 feet, and 101 square miles for publication on the scale of 1:31,680, with a contour interval of 5 feet. For the control of these areas and of the Coventry and Montrose quadrangles, in Montrose, San Miguel, Ouray, Gunnison, and Hinsdale counties, J. R. Ellis, Mr. Monbeck, R. W. Burchard, Mr. Rowell, and Mr. Moore ran 487 miles of primary levels and established 131 permanent bench marks, and for the control of the Naturita quadrangle C. F. Urquhart occupied

8 triangulation stations and permanently marked 9. The survey of the Creede quadrangle, lying partly in the San Juan, Cochetopa, and Rio Grande national forests, in Mineral, Rio Grande, and Saguache counties, was completed, and that of the Del Norte and Home quadrangles, lying partly in the Rio Grande, Cochetopa, Arapahoe, and Colorado national forests, in Alamosa, Jackson, Larimer, Rio Grande, and Saguache counties, was begun by Mr. Duke, C. A. Ecklund, R. C. Seitz, Cornelius Schnurr, and C. C. Holder, the area mapped being 703 square miles, for publication on the scale of 1:125,000, with a contour interval of 100 feet. Of this area 324 square miles is in the national forests. For the control of the Home quadrangle Mr. Ecklund and Roscoe Reeves ran 65 miles of primary levels and established 21 permanent bench marks. For the control of the Del Norte, Glenwood Springs, Kremmling, Home, Pagoda, Rabbit Ears Peak, Eagle, Leadville, Leon Peak, Mount Powell, Snow Mass Mountain, Gateway, Delta, Livermore, Grand Junction, Pinon Valley, Cameo, and De Beque quadrangles, Colorado, and the Sherman quadrangle, Wyoming, lying partly in the Leadville, Holy Cross, Sopris, Arapahoe, Colorado, Routt, White River, Gunnison, and Battlement national forests, in Eagle, Garfield, Rio Blanco, Routt, Grande, Jackson, Delta, Mesa, Moffat, Lake, Peak, Larimer, Summit, Chaffee, Pitkin, and Gunnison counties, Colo., and Albany and Laramie counties, Wyo., C. F. Urquhart, C. B. Kendall, and Mr. Ellis occupied 51 triangulation stations (1 in Wyoming) and marked 26.

The roads in the Mesa Verde National Park were located on the administrative map of the park by C. L. Nelson for the Department of the Interior, all the expenses of the work being borne by the Department.

Minnesota.—(See South Dakota, North Dakota, and Minnesota, p. 546.)

Montana.—The survey of the unmapped portion of the Nashua quadrangle, in Dawson and Valley counties, was completed, and that of the unmapped portion of the Nameless quadrangle, in Valley County, was begun by R. C. Seitz, the area mapped being 50 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet. The portions of these quadrangles lying in the Fort Peck Indian Reservation were mapped by the General Land Office. The survey of the unmapped portion of the Heart Butte quadrangle, lying partly in the Lewis and Clark National Forest, in Flathead and Teton counties, was completed by R. T. Evans, O. H. Nelson, and D. H. Watson, the area mapped being 389 square miles, for publication on the scale of 1 : 125,000, with a contour interval of 100 feet, 153 square miles being in the national forest. The remainder of this quadrangle, lying in the Blackfeet Indian Reservation, was mapped by the General Land Office. (See also Idaho-Montana, p. 549.)

Nebraska.—For the control of the Stella and Falls City quadrangles in Richardson County, S. H. Birdseye ran 13 miles of primary levels and established 2 permanent bench marks.

New Mexico.—The mapping of the Tularosa and Tres Hermanos quadrangles, in Dona Ana, Otero, Socorro, and Lincoln counties, was completed, and that of the Reserve quadrangle, lying partly in the Socorro National Forest, in Socorro County, was begun by R. C. Seitz, C. C. Gardner, S. T. Penick, C. C. Holder, and D. H. Watson, the total area mapped being 1,238 square miles, for publication on the scale of 1:125,000, with contour intervals of 50 and 100 feet. Of this area 462 square miles was in the national forest. For the control of these areas and of the Koehler, Soudders, Magdalena, Leura Springs, Datil, Mogollon, and Nutrioso quadrangles, in Sierra, Colfax, and Socorro counties, N. Mex., and Apache and Greenlee counties, Ariz., Mr. Holder and R. W. Burchard ran 712 miles of primary levels and established 186 permanent bench marks, of which 23 miles and 6 marks were in Arizona. For the control of the Koehler quadrangle Mr. Ellis occupied 10 triangulation stations and permanently marked 8. The resurvey of the Tyrone special area, in Grant County, was completed, and that of the Mogollon special area, in Socorro County, was begun by B. A. Jenkins and R. W. Berry, the area mapped being 42 square miles, for publication on the scale of 1:24,000, with a contour interval of 25 feet. The map of the Deming quadrangle, in Luna County, was revised by E. P. Davis, the area covered by this revision being 1,009 square miles, for publication on the scale of 1:125,000, with a contour interval of 100 feet. (See also Arizona, p. 553.)

North Dakota.—(See South Dakota, North Dakota, and Minnesota, p. 546.)

Oklahoma.—The director of the Oklahoma Geological Survey allotted $1,000 for the continuation of cooperative topographic surveys in that State and the United States Geological Survey allotted an equal amount. The survey of the Foraker quadrangle, in Osage County, was completed by S. T. Penick and R. R. Monbeck, the area mapped being 83 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 25 feet. The resurvey of the Kiefer and Bristow quadrangles, in Creek, Tulsa, and Okmulgee counties, was completed by R. T. Evans, Mr. Penick, C. C. Gardner, R. H. Reineck, Mr. Monbeck, A. O. Burkland, D. H. Watson, and C. R. Fisher, the area mapped being 484 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 25 feet. For the control of these areas Mr. Fisher and Mr. Monbeck ran 160 miles of primary levels and established 48 permanent bench marks, and C. B. Kendall and Mr. Fisher ran 94 miles of primary traverse and set 13 permanent marks. The cooperative funds being insufficient to cover the

completion of the mapping of these areas, the additional expenses were borne by the Federal Survey.

In addition to the cooperative work the revision of the map of the Hominy quadrangle, in Osage, Pawnee, Tulsa, and Creek counties, was completed by R. W. Berry, the total area covered by this revision being 206 square miles, for publication on the scale of 1 : 125,000, with a contour interval of 50 feet.

South Dakota, North Dakota, and Minnesota.—For the control of the White Rock quadrangle, in Roberts County, S. Dak., Richland County, N. Dak., and Traverse County, Minn., A. J. Kavanagh ran 12 miles of primary levels and established 4 permanent bench marks, of which 9 miles and 2 marks were in Minnesota and 3 miles and 2 marks in South Dakota.

Texas.—For the cooperative topographic survey of Harris County the county allotted $35,000 and the United States Geological Survey allotted $5,000. The mapping of the Erin, Deepwater, and Rice 7½-minute quadrangles was begun by C. H. Birdseye, B. A. Jenkins, W. B. Lewis, E. R. Bartlett, O. H. Nelson, J. H. Wilke, T. P. Pendleton, and F. A. Danforth, the area mapped being 48 square miles, for publication on the scale of 1 : 31,680, with a contour interval of 5 feet. For the control of these quadrangles and of the Settegast, Vollner, Hillendahl, Missouri City, Pearland, Strang, Almeda, Clodine, Barker, Katy, Swanson, Cypress, Ashford, Hockley, Rose Hill, Waller, Number Two, Louetta, Spring, Humble, Aldine, Kliber, Pauli, Huffman, Crosby, Hermaston, Fauna, and Stuebner quadrangles, E. L. McNair and W. F. Hicks ran 470 miles of primary traverse and set 147 permanent marks, and R. R. Monbeck ran 281 miles of primary levels and established 89 permanent bench marks.

In addition to the cooperative work, the mapping of the Henrietta quadrangle, in Clay, Archer, and Wichita counties, was begun by C. A. Ecklund and A. O. Burkland, the total area mapped being 21 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 25 feet. For the control of this area and of the Walter quadrangle, in Clay and Wichita counties, Roscoe Reeves ran 141 miles of primary levels and established 38 permanent bench marks, and for the control of these areas and of the Archer City and Eschite quadrangles, in Archer, Wichita, and Wilbarger counties, J. R. Ellis and Mr. Ecklund occupied 18 triangulation stations and marked 12. The mapping of the Sabine and Trinity River projects, in Wood, Smith, Dallas, Ellis, and Kaufman counties was commenced by C. H. Birdseye, B. A. Jenkins, W. B. Lewis, E. R. Bartlett, and R. R. Monbeck, the area mapped being 30 square miles, for publication on the scale of 1 : 12,000, with a contour interval of 2 feet. For the control of these areas E. L. McNair, Mr. Birdseye, and Mr. Monbeck ran 166 miles of primary levels and established 48 permanent bench marks,

and Mr. McNair ran 98 miles of primary traverse and set 36 permanent marks.

Wyoming.—The mapping of the Blue Mesa and Saddleback Hills quadrangles, in Carbon, Hot Springs, and Washakie counties, was completed by R. H. Reineck, C. C. Gardner, S. T. Penick, and C. R. Fisher, the total area mapped being 275 square miles, for publication on the scale of 1:62,500, with a contour interval of 25 feet. The mapping of the Moorcroft quadrangle, in Crook and Weston counties, was begun by Messrs. Gardner, Reineck, and Fisher, the area mapped being 282 square miles, for publication on the scale of 1:125,000, with a contour interval of 50 feet. For the control of these areas Mr. Fisher and G. R. Ruby ran 142 miles of primary levels and established 25 permanent marks.

OFFICE WORK.

The drafting of the following sheets was completed: Craig, Creede, and San Luis Lake, Colo.; Heart Butte and Nashua, Mont.; Deming (revision), N. Mex.; Tres Hermanos, Tularosa, and Tyrone special, N. Mex.; Bristow, Foraker, and Kiefer, Okla.; Claremore and Hominy (revision), Okla.; Mission, Sabine River, San Juan, and Trinity River, Tex.; Blue Mesa and Saddleback Hills, Wyo.

Progress in the drafting of additional sheets was made as follows: Del Norte, Colo., 18 per cent; Home, Colo., 7 per cent; Naturita, Colo., 22 per cent; Nameless, Mont., 83 per cent; Moorcroft, Wyo., 8 per cent.

The following computations and adjustments were made:

Primary-level circuits were adjusted for the Nutrioso (Ariz.-N. Mex.), Coventry, Del Norte, Home, Hooper, La Jara, Lay, Montrose, Naturita, Saguache, and Silesia (Colo.), Dodson and Hays (Mont.), Datil, Tres Hermanos, Koehler, Luera Springs, Magdalena, Ojo Caliente, Patterson, Reserve, Shiprock, Soudders, Pineville, and Tularosa (N. Mex.), Blue Butte and Elbowoods (N. Dak.), Nuyaka (Okla.), Archer City, Eschite, Henrietta, Walter, Almeda, Deepwater, Erin, Missouri City, Pearland, Rice and Strang, and the Wills Point and Mineola (Sabine River project) and Dallas and Kaufman (Trinity River project) (Tex.), Thermopolis and Widdowfield (Wyo.) quadrangles.

Geographic positions were computed for the Del Norte, Grand Junction, Eagle, Glenwood Springs, Kremmling, Leadville, Leon Peak, Naturita, Meeker, Mount Jackson, Mount Powell, Pagoda, Rabbit Ears Peak, DeBeque, Delta, Gateway, Palisades, Rifle, and Snow Mass Mountain (Colo.), Koehler (N. Mex.), Bristow and Kiefer (Okla.), Almeda, Archer City, Eschite, Henrietta, Bonham, Dallas (Trinity River project), Wills Point (Sabine River project), Almeda, Deepwater, Erin, Missouri City, Paris, Pearland, Petrolia, Rice,

Strang, Webster, Barker, Clodine, Cypress, Hillendahl, Katy, Missouri City, Swanson, Vollner, Aldine, Ashford, Hockley, Louetta, Rose Hill, Spring, and Waller (Harris County) (Tex.) quadrangles.

NORTHWESTERN DIVISION.

FIELD WORK.

Summary.—During the season topographic mapping was carried on in Idaho, Oregon, and Washington and in a small area in Montana. This work comprised the completion of the survey of 10 quadrangles and the partial survey of 10 quadrangles. The total new area mapped was 4,008 square miles; 2,974 square miles for publication on the scale of 1 : 125,000; 870 square miles for publication on the scale of 1 : 62,500; and 164 square miles for publication on the scale of 1 : 31,680. In connection with this work 747 miles of primary levels were run and 202 permanent bench marks were established. In addition, profile surveys were made of portions of 5 rivers, the distance traversed being 262 linear miles for publication on the scale of 1 : 31,680.

Primary triangulation and primary traverse were carried on at different times by five parties in portions of Idaho, Montana, Oregon, and Washington. The total area covered by this primary control was about 7,200 square miles, of which about 575 square miles was controlled by primary traverse, 149 miles being run and 40 permanent marks set. Sixty-five triangulation stations were occupied and 58 permanently marked. This work made control available in 23 quadrangles.

Topographic surveys in northwestern division from July 1, 1914, to June 30, 1915.

State.	Contour interval.	For publication on scale of—			Total area surveyed.	Primary levels.		Primary traverse.		Triangulation.	
		1:125,000	1:62,500	1:31,680		Distance run.	Bench marks.	Distance run.	Permanent marks.	Stations occupied.	Stations marked.
	Feet.	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Miles.*		*Miles.*			
Idaho	50, 100	334	351	2	687	178	35	.....	.....	62	58
Oregon	5, 25, 50, 100	1,305	304	162	1,771	357	112	79	20	.....	.....
Washington	25, 50	1,217	215	.....	1,432	212	55	70	20	.....	.....
Montana	100	118	.....	.....	118	.....	.....	.....	.....	3	.....
		2,974	870	164	4,008	747	202	149	40	65	58

Idaho.—The mapping of the Henry and Portneuf quadrangles, in Bannock County, was completed, and that of the Mink Creek quadrangle, lying partly in the Cache National Forest, in Bannock, Bear Lake, and Franklin counties, was begun by Albert Pike, J. L. Lewis, and C. G. Anderson, the area mapped being 563 square miles, 351

square miles for publication on the scale of 1:62,500, with a contour interval of 50 feet, and 212 square miles for publication on the scale of 1:125,000, with a contour interval of 100 feet. Of this area 80 square miles was in the national forest. For the control of these areas and of the Soda Springs quadrangle, in Bannock and Bear Lake counties, F. L. Whaley ran 178 miles of primary levels and established 35 permanent bench marks. For the control of these areas, and of the Malad City and Sterrett quadrangles, and the south half of the Ammon quadrangle, in Bannock, Bingham, and Oneida counties, H. H. Hodgeson and T. M. Bannon occupied 22 and marked 21 triangulation stations. A profile survey of Snake River was commenced by C. G. Anderson, the distance traversed being 48 linear miles in Madison County. In connection with this work 2 square miles covering a power site were surveyed.

Idaho-Montana.—The mapping of the Avery quadrangle, lying partly in the Lolo, Cabinet, St. Joe, and Cœur d'Alene national forests, in Shoshone County, Idaho, and Mineral and Sanders counties, Mont., was completed, and that of the St. Regis quadrangle, lying partly in the St. Joe, Lolo, and Cabinet national forests, in the same counties, was begun by J. E. Blackburn, the total area mapped being 240 square miles, for publication on the scale of 1:125,000, with a contour interval of 100 feet. Of this area 178 square miles is in the national forests and 118 square miles in Montana. In connection with the mapping of the Avery quadrangle 5 square miles of the map of the Cœur d'Alene National Forest was revised. For the control of the Salmon, Noble, Gibbons Pass, Vinegar Hill, Casto, Rabbit Foot, May, Custer, Bay Horse, Mackay, and Hailey quadrangles, lying partly in the Bitterroot, Selway, Beaverhead, Salmon, Lemhi, Idaho, Sawtooth, Nez Perce, and Challis national forests, in Lemhi and Custer counties, Idaho, and Ravalli and Beaverhead counties, Mont., T. M. Bannon occupied 43 triangulation stations (3 in Montana) and marked 37.

Oregon.—For the continuation of cooperative topographic surveys in Oregon the State engineer allotted $18,000 and the United States Geological Survey allotted an equal amount. In the survey of the Willamette Valley the mapping of the Salem, Corvallis, Lebanon, and Brownsville quadrangles, in Benton, Marion, Linn, and Polk counties, was continued, and that of the Dallas quadrangle, in Polk County, was begun by Charles Hartmann, Olinus Smith, J. H. Le Feaver, R. B. Kilgore, and D. S. Birkett, the total area mapped being 162 square miles for publication on the scale of 1:31,680, with a contour interval of 5 feet. For the control of these areas Mr. Birkett and E. M. Bandli ran 82 miles of primary levels and established 27 permanent bench marks. The mapping of the Tualatin and Condon quadrangles, in Clackamas, Washington, Jefferson, Yamhill, Gilliam, Morrow, Sher-

Strang, Webster, Barker, Clodine, Cypress, Hillendahl, Katy, Missouri City, Swanson, Vollner, Aldine, Ashford, Hockley, Louetta, Rose Hill, Spring, and Waller (Harris County) (Tex.) quadrangles.

NORTHWESTERN DIVISION.

FIELD WORK.

Summary.—During the season topographic mapping was carried on in Idaho, Oregon, and Washington and in a small area in Montana. This work comprised the completion of the survey of 10 quadrangles and the partial survey of 10 quadrangles. The total new area mapped was 4,008 square miles; 2,974 square miles for publication on the scale of 1 : 125,000; 870 square miles for publication on the scale of 1 : 62,500; and 164 square miles for publication on the scale of 1:31,680. In connection with this work 747 miles of primary levels were run and 202 permanent bench marks were established. In addition, profile surveys were made of portions of 5 rivers, the distance traversed being 262 linear miles for publication on the scale of 1 : 31,680.

Primary triangulation and primary traverse were carried on at different times by five parties in portions of Idaho, Montana, Oregon, and Washington. The total area covered by this primary control was about 7,200 square miles, of which about 575 square miles was controlled by primary traverse, 149 miles being run and 40 permanent marks set. Sixty-five triangulation stations were occupied and 58 permanently marked. This work made control available in 23 quadrangles.

Topographic surveys in northwestern division from July 1, 1914, to June 30, 1915.

State.	Contour interval.	For publication on scale of—			Total area surveyed.	Primary levels.		Primary traverse.		Triangulation.	
		1:125,000	1 : 62,500	1 : 31,680		Distance run.	Bench marks.	Distance run.	Permanent marks.	Stations occupied.	Stations marked.
	Feet.	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Miles.*		*Miles.*			
Idaho	50, 100	334	351	2	687	178	35	.....	.....	62	58
Oregon	5, 25, 50, 100	1,305	304	162	1,771	357	112	79	20	.....	.....
Washington	25, 50	1,217	215	.....	1,432	212	55	70	20	.....	.....
Montana	100	118	.....	.....	118	.....	.....	.....	.....	3	.....
		2,974	870	164	4,008	747	202	149	40	65	58

Idaho.—The mapping of the Henry and Portneuf quadrangles, in Bannock County, was completed, and that of the Mink Creek quadrangle, lying partly in the Cache National Forest, in Bannock, Bear Lake, and Franklin counties, was begun by Albert Pike, J. L. Lewis, and C. G. Anderson, the area mapped being 563 square miles, 351

erval of 30 feet. The mapping
partly in the Rainier National
ton counties, was completed, and
Benton, Klickitat, and Yakima
H. L. McDonald, N. E. Ballmer,
L. Wilson, the area mapped being
on the scale of 1
his area 14
the
Walla
counties, D. S.
shed 36 permanent

the control of the Mount
lying partly in the Columbia
Clarke, Cowlitz, Lewis, Pierce,
Mr. Biggs and C. P. McKinley
and set 17 permanent marks, and
Helens quadrangle and also of the
tz County, Mr. Biggs ran 89 miles of
ed 19 permanent bench marks.

OFFICE WORK.

following sheets was completed: Henry and
very, Idaho-Mont.; Condon, Diamond Lake,
er, Tualatin, Umpqua River, White River, and
, Oreg.; Chehalis, Coyote Rapids, Pasco, and
ash.

e drafting of additional sheets was made as follows:
o-Mont., 33 per cent; Brownsville, Oreg., 15 per cent;
g., 30 per cent; Dallas, Oreg., 17 per cent; Lebanon,
cent; Salem, Oreg., 45 per cent.

ving computations and adjustments were made:
level circuits were adjusted for the Bruneau, Portneuf,
nes Creek, Mink Creek, Mountain Home, Riddle, and Tin-
Brownsville, Condon, Corvallis, Diamond Lake, Diamond
, Heisler, Hillsboro, Lebanon, and Twickenham (Oreg.);
nt St. Helens, and St. Helens (Wash.) quadrangles.
positions were computed for the Bay Horse, Casto,
y, May, Nicholia, Noble, Rabbit Foot, and Vinegar
Junction, Polaris, Noble, and Salmon (Idaho-Mont.);
eg.); and Kalama and Mount St. Helens (Wash.)

man, and Wheeler counties, was completed, and that of the Hillsboro quadrangle, in Columbia, Multnomah, and Washington counties, was begun by C. H. Birdseye, Albert Pike, C. L. Sadler, Fred Graff, jr., S. G. Lundey, O. H. Nelson, and J. H. Le Feaver, the total area mapped being 959 square miles, 655 square miles for publication on the scale of 1:125,000, with a contour interval of 50 feet, and 304 square miles for publication on the scale of 1:62,500, with a contour interval of 25 feet. For the control of the Condon and Hillsboro quadrangles and also of the Twickenham and Heisler quadrangles, in Crook, Jefferson, Wheeler, and Wasco counties, E. M. Bandli ran 134 miles of primary levels and established 45 permanent bench marks, and for the control of the Hillsboro quadrangle L. F. Biggs ran 79 miles of primary traverse and set 20 permanent marks. Profile surveys of portions of Willamette, Umpqua, and White rivers were made by Albert Pike and C. P. McKinley, the distance traversed being 172 linear miles in Douglas, Lane, and Wasco counties. Of this distance 60 miles lies in the Cascade and Umpqua national forests.

In addition to the cooperative work in Oregon, the mapping of the Diamond Lake quadrangle in the Crater, Cascade, Paulina, and Umpqua national forests, in Douglas, Klamath, Jackson, and Lane counties, was completed, and that of the Kerby quadrangle, lying partly in the Siskiyou National Forest, in Curry and Josephine counties, was begun by J. G. Staack, A. O. Burkland, R. B. Kilgore, R. M. Wilson, and John McCombs, the total area mapped being 650 square miles, for publication on the scale of 1:125,000, with a contour interval of 100 feet. Of this area 600 square miles is in the national forests. For the control of this area and of the Diamond Peak, Disston, Wendling, and Eugene quadrangles, lying partly in the Cascade, Paulina, Santiam, and Umpqua national forests, in Douglas, Lane, Klamath, and Linn counties, R. M. Wilson ran 141 miles of primary levels and established 40 permanent bench marks. A profile survey of the portion of North Umpqua River in the Diamond Lake quadrangle was made by Mr. Kilgore, the distance traversed being 42 linear miles, for publication on the scale of 1:48,000, with contour intervals of 5 and 25 feet.

Washington.—For the continuation of cooperative topographic surveys in Washington the State Board of Geological Survey allotted $11,500 and the United States Geological Survey allotted an equal amount. The mapping of the Coyote Rapids, Priest Rapids, and Pasco quadrangles, in Benton, Grant, Kittitas, Yakima, Franklin, and Walla Walla counties, was completed by H. L. McDonald and S. G. Lunde, the total area mapped being 816 square miles, 215 square miles for publication on the scale of 1 : 62,500, with a contour interval of 25 feet, and 601 square miles for publication on the scale

of 1 : 125,000, with a contour interval of 50 feet. The mapping of the Chehalis quadrangle, lying partly in the Rainier National Forest, in Lewis, Pierce, and Thurston counties, was completed, and that of the Prosser quadrangle, in Benton, Klickitat, and Yakima counties, was begun by W. O. Tufts, H. L. McDonald, N. E. Ballmer, L. V. Fees, John McCombs, and A. L. Wilson, the area mapped being 616 square miles, for publication on the scale of 1 : 125,000, with a contour interval of 50 feet. Of this area 1½ square miles is in the national forest. For the control of the Chehalis quadrangle L. F. Biggs ran 7 miles of primary traverse and set 3 permanent marks. For the control of the Prosser quadrangle and also of the Wallula quadrangle, in Benton, Franklin, and Walla Walla counties, D. S. Birkett ran 123 miles of primary levels and established 36 permanent bench marks.

In addition to the cooperative work, for the control of the Mount St. Helens and Eatonville quadrangles, lying partly in the Columbia and Rainier national forests, in Clarke, Cowlitz, Lewis, Pierce, Skamania, and Thurston counties, Mr. Biggs and C. P. McKinley ran 63 miles of primary traverse and set 17 permanent marks, and for the control of the Mount St. Helens quadrangle and also of the Kalama quadrangle, in Cowlitz County, Mr. Biggs ran 89 miles of primary levels and established 19 permanent bench marks.

OFFICE WORK.

The drafting of the following sheets was completed: Henry and Portneuf, Idaho; Avery, Idaho-Mont.; Condon, Diamond Lake, North Umpqua River, Tualatin, Umpqua River, White River, and Willamette River, Oreg.; Chehalis, Coyote Rapids, Pasco, and Priest Rapids, Wash.

Progress in the drafting of additional sheets was made as follows: St. Regis, Idaho-Mont., 33 per cent; Brownsville, Oreg., 15 per cent; Corvallis, Oreg., 30 per cent; Dallas, Oreg., 17 per cent; Lebanon, Oreg., 37 per cent; Salem, Oreg., 45 per cent.

The following computations and adjustments were made:

Primary-level circuits were adjusted for the Bruneau, Portneuf, Henry, Lanes Creek, Mink Creek, Mountain Home, Riddle, and Tindall (Idaho); Brownsville, Condon, Corvallis, Diamond Lake, Diamond Peak, Disston, Heisler, Hillsboro, Lebanon, and Twickenham (Oreg.); Kalama, Mount St. Helens, and St. Helens (Wash.) quadrangles.

Geographic positions were computed for the Bay Horse, Casto, Custer, Dickey, May, Nicholia, Noble, Rabbit Foot, and Vinegar Hill (Idaho); Junction, Polaris, Noble, and Salmon (Idaho-Mont.); Hillsboro (Oreg.); and Kalama and Mount St. Helens (Wash.) quadrangles.

PACIFIC DIVISION.

FIELD WORK.

Summary.—During the season topographic mapping was carried on in Arizona, California, Nevada, and Utah. This work comprised the completion of the survey of 19 quadrangles and the resurvey of 4 quadrangles and 1 special area, in addition to which 4 quadrangles were partly surveyed. The map of a partial quadrangle was revised to bring it up to date with the new work, the area covered by this revision being 210 square miles. The total new area mapped was 5,161 square miles, 3,641 square miles for publication on the scale of 1 : 125,000, 995 square miles for publication on the scale of 1 : 62, 500, and 525 square miles for publication on the scale of 1 : 31,680. The area resurveyed was 504 square miles, 167 square miles for publication on the scale of 1 : 125,000, 299 square miles for publication on the scale of 1 : 62,500, and 38 square miles for publication on the scale of 1 : 24,000. In connection with this work 787 miles of primary and precise levels were run and 167 permanent bench marks were established. In addition, profile surveys were made of 7 rivers, the distance traversed being 236 linear miles.

Primary triangulation was carried on at different times by four parties, the work being distributed over portions of California and Nevada. The total area covered by this primary control was about 3,600 square miles, 71 triangulation stations being occupied and 37 marked. The result of this work was to make control available in 44 quadrangles.

Topographic surveys were made in the Territory of Hawaii, covering portions of one island (Hawaii). The survey of one 15-minute quadrangle was completed, the area mapped being 19 square miles, for publication on the scale of 1 : 31,680, with a contour interval of 10 feet.

Topographic surveys in Pacific division from July 1, 1914, to June 30, 1915.

State.	Contour interval.	For publication on scale of—						Total area surveyed.	Primary and precise levels.		Triangulation.	
		1:125,000		1:62,500		1:31,680	1:24,000					
		New	Resurvey.	New	Resurvey.	New	Resurvey.		Distance run.	Bench marks.	Stations occupied.	Stations marked.
	Feet.	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Sq. mi.*	*Miles.*			
Arizona	25,100	642	.....	290	.....	.....	.....	932	165	32	.....	.....
California	5,25,100	2,362	.....	705	60	525	.....	3,661	420	86	63	32
Nevada	5	53	.....	.....	.....	.....	38	84	150	39	8	5
Utah	50,100	507	167	.....	230	.....	.....	911	43	10	.....	.....
New Mexico	100	77	.....	.....	.....	.....	.....	77	.....	.....	.....	.....
		3,641	167	995	299	525	38	5,665	787	167	71	37
Hawaii	10	.....	.....	.....	.....	19	.....	.....	.....	.....	.....	.....

Arizona.—The survey of the Gila Butte and Christmas quadrangles, in Maricopa, Gila, and Pinal counties, was completed by T. P. Pendleton and C. A. Stonesifer, the total area mapped being 290 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 25 feet. In connection with the mapping of the Gila Butte quadrangle, the map of the area previously surveyed was revised, the total area covered by this revision being 210 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 25 feet. For the control of the Christmas and Ray quadrangles, in Gila and Pinal counties, S. H. Birdseye ran 50 miles of primary levels and established 10 permanent bench marks. The mapping of the San Simon quadrangle, lying partly in the Chiricahua National Forest, in Cochise, Graham, and Greenlee counties, Ariz., and Grant County, N. Mex., was completed by F. A. Danforth and Cornelius Schnurr, the area mapped being 719 square miles, for publication on the scale of 1 : 125,000, with a contour interval of 100 feet. Of this area 61 square miles is in the national forest and 77 square miles in New Mexico. For the control of this area and of the Duncan, Solomonsville, San Carlos, Bisbee, and Pearce quadrangles, lying partly in the Apache, Chiricahua, Crook, and Gila national forests, in Gila, Cochise, Graham, Greenlee, and Pinal counties, Ariz., and Grant County, N. Mex., Mr. Birdseye ran 115 miles of primary levels and established 22 permanent bench marks, all this work being in Arizona. (See also New Mexico, p. 545.)

California.—For the continuation of cooperative topographic surveys in California the department of engineering allotted $14,000 and the United States Geological Survey allotted an equal amount. In continuation of the survey of the San Joaquin Valley the mapping of the Denair, Cressy, Ceres, Crows Landing, Mitchell School, Winton, Merced, Hopeton, and Turlock 7½-minute quadrangles and of the Copperopolis 15-minute quadrangle, in Calaveras, Merced, Stanislaus, and Tuolumne counties, was completed by A. O. Burkland, H. W. Peabody, A. J. Ogle, J. B. Leavitt, S. H. Birdseye, F. A. Danforth, and C. A. Stonesifer, the total area mapped being 683 square miles, 525 square miles for publication on the scale of 1 : 31,680, with a contour interval of 5 feet, and 158 square miles for publication on the scale of 1 : 62,500, with a contour interval of 25 feet. For the control of the Crows Landing, Mitchell School, Turlock, Stevinson, No. VII, No. VIII, No. IX, No. X, Deadman Creek, Kearney Peak, Le Grand, Jesbel, Clovis, Chowchilla Slough, Minturn, Berendo, Fresno, Friant, Herndon, Planada, Plainsberg, Sharon, Madera, Bridge, No. XV, No. XVI, No. XVII, No. XIX, No. XX, No. XXI, Merced, Newman, Ingomar, Owens Creek, Las Garzas Creek, San Luis Creek, Mariposa Slough, Salt Slough, Gustine, Volta, Los Banos, Elgin, Center School, and Daulton 7½-minute quadrangles

completion of the mapping of these areas, the additional expenses were borne by the Federal Survey.

In addition to the cooperative work the revision of the map of the Hominy quadrangle, in Osage, Pawnee, Tulsa, and Creek counties, was completed by R. W. Berry, the total area covered by this revision being 206 square miles, for publication on the scale of 1 : 125,000, with a contour interval of 50 feet.

South Dakota, North Dakota, and Minnesota.—For the control of the White Rock quadrangle, in Roberts County, S. Dak., Richland County, N. Dak., and Traverse County, Minn., A. J. Kavanagh ran 12 miles of primary levels and established 4 permanent bench marks, of which 9 miles and 2 marks were in Minnesota and 3 miles and 2 marks in South Dakota.

Texas.—For the cooperative topographic survey of Harris County the county allotted $35,000 and the United States Geological Survey allotted $5,000. The mapping of the Erin, Deepwater, and Rice 7½-minute quadrangles was begun by C. H. Birdseye, B. A. Jenkins, W. B. Lewis, E. R. Bartlett, O. H. Nelson, J. H. Wilke, T. P. Pendleton, and F. A. Danforth, the area mapped being 48 square miles, for publication on the scale of 1 : 31,680, with a contour interval of 5 feet. For the control of these quadrangles and of the Settegast, Vollner, Hillendahl, Missouri City, Pearland, Strang, Almeda, Clodine, Barker, Katy, Swanson, Cypress, Ashford, Hockley, Rose Hill, Waller, Number Two, Louetta, Spring, Humble, Aldine, Kliber, Pauli, Huffman, Crosby, Hermaston, Fauna, and Stuebner quadrangles, E. L. McNair and W. F. Hicks ran 470 miles of primary traverse and set 147 permanent marks, and R. R. Monbeck ran 281 miles of primary levels and established 89 permanent bench marks.

In addition to the cooperative work, the mapping of the Henrietta quadrangle, in Clay, Archer, and Wichita counties, was begun by C. A. Ecklund and A. O. Burkland, the total area mapped being 21 square miles, for publication on the scale of 1 : 62,500, with a contour interval of 25 feet. For the control of this area and of the Walter quadrangle, in Clay and Wichita counties, Roscoe Reeves ran 141 miles of primary levels and established 38 permanent bench marks, and for the control of these areas and of the Archer City and Eschite quadrangles, in Archer, Wichita, and Wilbarger counties, J. R. Ellis and Mr. Ecklund occupied 18 triangulation stations and marked 12. The mapping of the Sabine and Trinity River projects, in Wood, Smith, Dallas, Ellis, and Kaufman counties was commenced by C. H. Birdseye, B. A. Jenkins, W. B. Lewis, E. R. Bartlett, and R. R. Monbeck, the area mapped being 30 square miles, for publication on the scale of 1 : 12,000, with a contour interval of 2 feet. For the control of these areas E. L. McNair, Mr. Birdseye, and Mr. Monbeck ran 166 miles of primary levels and established 48 permanent bench marks,

and Mr. McNair ran 98 miles of primary traverse and set 36 permanent marks.

Wyoming.—The mapping of the Blue Mesa and Saddleback Hills quadrangles, in Carbon, Hot Springs, and Washakie counties, was completed by R. H. Reineck, C. C. Gardner, S. T. Penick, and C. R. Fisher, the total area mapped being 275 square miles, for publication on the scale of 1:62,500, with a contour interval of 25 feet. The mapping of the Moorcroft quadrangle, in Crook and Weston counties, was begun by Messrs. Gardner, Reineck, and Fisher, the area mapped being 282 square miles, for publication on the scale of 1:125,000, with a contour interval of 50 feet. For the control of these areas Mr. Fisher and G. R. Ruby ran 142 miles of primary levels and established 25 permanent marks.

OFFICE WORK.

The drafting of the following sheets was completed: Craig, Creede, and San Luis Lake, Colo.; Heart Butte and Nashua, Mont.; Deming (revision), N. Mex.; Tres Hermanos, Tularosa, and Tyrone special, N. Mex.; Bristow, Foraker, and Kiefer, Okla.; Claremore and Hominy (revision), Okla.; Mission, Sabine River, San Juan, and Trinity River, Tex.; Blue Mesa and Saddleback Hills, Wyo.

Progress in the drafting of additional sheets was made as follows: Del Norte, Colo., 18 per cent; Home, Colo., 7 per cent; Naturita, Colo., 22 per cent; Nameless, Mont., 83 per cent; Moorcroft, Wyo., 8 per cent.

The following computations and adjustments were made:

Primary-level circuits were adjusted for the Nutrioso (Ariz.-N. Mex.), Coventry, Del Norte, Home, Hooper, La Jara, Lay, Montrose, Naturita, Saguache, and Silesia (Colo.), Dodson and Hays (Mont.), Datil, Tres Hermanos, Koehler, Luera Springs, Magdalena, Ojo Caliente, Patterson, Reserve, Shiprock, Soudders, Pineville, and Tularosa (N. Mex.), Blue Butte and Elbowoods (N. Dak.), Nuyaka (Okla.), Archer City, Eschite, Henrietta, Walter, Almeda, Deepwater, Erin, Missouri City, Pearland, Rice and Strang, and the Wills Point and Mineola (Sabine River project) and Dallas and Kaufman (Trinity River project) (Tex.), Thermopolis and Widdowfield (Wyo.) quadrangles.

Geographic positions were computed for the Del Norte, Grand Junction, Eagle, Glenwood Springs, Kremmling, Leadville, Leon Peak, Naturita, Meeker, Mount Jackson, Mount Powell, Pagoda, Rabbit Ears Peak, DeBeque, Delta, Gateway, Palisades, Rifle, and Snow Mass Mountain (Colo.), Koehler (N. Mex.), Bristow and Kiefer (Okla.), Almeda, Archer City, Eschite, Henrietta, Bonham, Dallas (Trinity River project), Wills Point (Sabine River project), Almeda, Deepwater, Erin, Missouri City, Paris, Pearland, Petrolia, Rice,

forest. In connection with the mapping of the Logan quadrangle profile surveys of Logan and Blacksmith Fork rivers were made by Mr. Hodgeson, the distance traversed being 37 linear miles, for publication on the scale of 1 : 48,000, with a contour interval of 25 feet. The resurvey of the Vernal, Wellington, and Castle Gate quadrangles, in Uinta and Carbon counties, was completed by E. R. Bartlett and Cornelius Schnurr, the total area mapped being 397 square miles—167 square miles for publication on the scale of 1 : 125,000, with a contour interval of 100 feet, and 230 square miles for publication on the scale of 1 : 62,500, with a contour interval of 50 feet. For the control of the Castle Gate quadrangle Mr. Schnurr ran 42 miles of primary levels and established 10 permanent bench marks. (See also Nevada, p. 555.)

Hawaii.—To complete the cooperative topographic work begun under the agreement for the fiscal year 1914 the Territory of Hawaii allotted $837.35 and the United States Geological Survey allotted $305. The survey of the island of Hawaii was continued, the area mapped being 19 square miles, for publication on the scale of 1:31,680, with a contour interval of 10 feet. This work, which was done by A. T. Fowler, completed the mapping of the Hilo 15-minute quadrangle.

OFFICE WORK.

The drafting of the following sheets was completed: Gila Butte, Pearce, and San Simon, Ariz.; Ceres, Copperopolis, Cressy, Crows Landing, Denair, Riverbank, Klamath River, Mare Island, Merced, Mitchell School, Hopeton, Salmon River, Santa Rosa, Sawyers Bar, Scott River, Seiad, Stanislaus River, Turlock, Waterford, and Winton, Cal.; San Francisco and vicinity (revision), Cal.; Manhattan mining district and Yerington mining district, Nev.; Blacksmith Fork River, Castle Gate, Duchesne River, Green River, Logan, Logan River, Uinta River, Vernal, Wellington, and White River, Utah.

Progress in the mapping of additional sheets was made as follows: White Mountain, Cal.-Nev., 70 per cent; Hilo, Hawaii, 74 per cent.

The following computations and adjustments were made:

Primary-level circuits were adjusted for the Christmas, Maricopa, and Pearce quadrangles (Ariz.), the Nutrioso and San Simon quadrangles (Ariz.-N. Mex.), the Bridgeport, Copperopolis, Elizabeth Lake, Mount Lyell, and Mount Morrison quadrangles, and the San Joaquin Valley (Cal.), the Aura, Carson Sink, Delamar, Elko, Kumiva, Panaca, Pyramid, Reno, and Wadsworth quadrangles (Nev.), and the Castle Gate (Utah) quadrangle.

Precise leveling was adjusted for new lines from Kern via Mohave to Orange and from Florence to San Pedro, Cal., and for old lines from Benicia to Kern and from Barstow to Mohave, Cal.

Geographic positions were computed for the Santa Rosa (Cal.), Hilo (Hawaii), Vernal (Utah) quadrangles and for the Mitchell School, Turlock, Cressy, Winton, Hopeton, Stevinson, No. VIII, Atwater, Merced, Planada, Mariposa Slough, and Owens Creek (Cal.) 7½-minute quadrangles.

SECTION OF FIELD EQUIPMENT.

During the year 1914 a section of field equipment was organized for the custody of all field equipment of the three field branches of the Survey. The personnel of the section consists of E. M. Douglas, two clerks, and one laborer.

During the year this section received and recorded all incoming field instruments and supplies, and packed and shipped all outgoing instruments. The custody of topographic notebooks and field records was assigned to the section, as well as the general supervision of instrument repair work in the Survey instrument shop. With the exception of extensive repairs to such instruments as aneroid barometers, leveling rods, cameras, and microscopes, for which the Survey shop is not at present fitted, the shop, under the immediate charge of Ernest Kübel with one assistant, made repairs or alterations to more than 2,000 different articles, including 205 standard telescopic alidades, 53 Gale alidades, 62 Y levels, 12 transits, 11 theodolites, 175 box compasses, 119 Brunton and other compasses, 50 tally registers, and 133 sight alidades. The instrument shop also made, resurfaced, or electrotyped over 140,000 square inches of plates.

INSPECTION OF TOPOGRAPHIC SURVEYING AND MAPPING.

J. H. Renshawe spent two months in inspecting field work in the Atlantic division. W. M. Beaman visited topographic parties in the central, Rocky Mountain, and northwestern divisions and made frequent field inspections of the work on the large-scale map of Washington, D. C., and vicinity. A. M. Walker inspected field parties in the Atlantic and central divisions. Mr. Beaman spent one month and Mr. Walker two months in field work on the Washington and vicinity map.

The office duties of Messrs. Beaman and Walker included supervision of the inking of all topographic field sheets and office preparation of river-profile and land-classification sheets and reports and final examination of them prior to photolithography, engraving, and proper transmission; also attention to the referred matter of a technical nature pertaining to the branch as a whole rather than to any particular topographic division. Mr. Beaman's office duties also included special attention to river-profile surveys, the supervision of the map of Washington and vicinity, and cooperation with M. R.

Campbell in the preparation of a set of 50 topographic sheets illustrating physiographic and engineering features for the use of schools and in the selection and description of an exhibit of topographic sheets for the Panama-Pacific Exposition at San Francisco.

Mr. Renshawe's entire office time was spent in preparing colored relief maps of national parks and in similar work, as reported in detail on page 529.

MILLIONTH-SCALE MAP OF THE UNITED STATES.

Of the work in progress last year on the 1 : 1,000,000 scale map of the United States, under the direction of A. F. Hassan, the base map of Oregon (portions of sheets K–10, K–11, L–10, and L–11) was completed, as was the contouring of sheet K–18. New work included the adjustment of 35 per cent of the township lines and 20 per cent of the compilation and inking of the base map of Idaho (portions of sheets K–11, K–12, L–11, L–12, and M–11), the completion of the base map of the Navajo country, Arizona, and New Mexico (portions of sheets I–12, I–13, J–12 and J–13), and the compilation and inking of the contours for 60 per cent of sheet J–18, 80 per cent of sheet J–17, 15 per cent of sheet J–16, 40 per cent of sheet J–15, 25 per cent of sheet I–17, 40 per cent of sheet I–16, 20 per cent of sheet I–15, and 65 per cent of the United States portion of sheet K–17. Roads were compiled and inked for 30 per cent of sheet J–17, for 75 per cent of sheet J–18, and for 25 per cent of sheet K–18.

Three tracings and 21 maps were also prepared for the Bureau of Fisheries, all the expenses of the work being borne by that bureau.

Tracings of six sheets of an enlargement of the map of San Luis Valley, Colorado, were also prepared for the Reclamation Service.

WATER-RESOURCES BRANCH.

ORGANIZATION AND SCOPE OF WORK.

The water-resources branch includes three divisions—surface water, ground water, and water utilization—each of which is subdivided into sections for field work. The organization is as follows:

Chief of branch, N. C. Grover, chief hydraulic engineer.
Division of surface waters, John C. Hoyt, hydraulic engineer, in charge.
Division of ground waters, O. E. Meinzer, geologist, in charge.
Division of water utilization, N. C. Grover, chief hydraulic engineer, in charge.

PERSONNEL.

During the year the technical force of the water-resources branch has been reduced 10 by transfers, resignations, and deaths and has been increased 9 by new appointments. At the end of the year the force consisted of 1 chief hydraulic engineer, 12 hydraulic engineers, 28 assistant engineers, 25 junior engineers, 1 hydrographer, 1 geol-

ogist, 1 associate geologist, 3 assistant geologists, 1 geologic aid, 1 chemist, 1 assistant chemist, and 1 junior chemist, a total of 76. Of this number, 1 hydraulic engineer, 3 assistant engineers, 1 assistant chemist, and 3 junior engineers are on furlough; and 1 hydraulic engineer, 1 hydrographer, 3 assistant engineers, and 1 assistant geologist are employed occasionally.

In the clerical force there were 2 separations and 3 accessions. At the end of the year the force consisted of 2 senior clerks, 1 clerk, 9 junior clerks, 9 under clerks, 1 copyist, 1 stenographer, 1 clerk-stenographer, 1 draftsman, and 1 messenger boy.

ALLOTMENTS.

The appropriation was the same as in the preceding year ($150,000). The cooperative funds made available by State allotments have been increased in some States and decreased in others, making necessary corresponding adjustments of the work.

The appropriation for the fiscal year was allotted as follows:

Allotments of appropriation for investigation of water resources, 1914–15.

Administrative expenses of the Survey		$10,344
Branch administration		8,250
Computations and reports		17,000
Inspection		1,500
Stream gaging in—		
New York and New England States	$5,650	
Virginia and Maryland	600	
South Atlantic and Gulf States	5,500	
Ohio Valley	6,000	
Upper Mississippi Valley States	5,000	
Colorado and Wyoming	6,500	
Montana	4,500	
North Dakota	300	
Utah	4,500	
Nevada	2,500	
Idaho	4,500	
Oregon	4,500	
Washington	4,500	
California	4,500	
New Mexico	4,500	
Arizona	3,000	
Hawaii	5,000	
Yellowstone National Park	200	
		71,750
Investigation of ground waters, including quality of waters		17,500
Land-classification board		11,000
Water-power investigations		11,000
Contingent		1,656
		150,000

Of the total appropriation, 64 per cent was allotted for work in public-land States.

COOPERATION.

States.—Cooperative funds were allotted by several States as follows:

Amounts allotted by States for cooperative work with United States Geological Survey in investigation of water resources.

Alabama		$170
Arizona		3,900
California—		
State engineer	$6,700	
Conservation commission	1,300	
City of San Diego	1,000	
City of San Francisco	4,200	
		13,200
Colorado		480
Connecticut		1,000
Hawaii		15,400
Idaho		1,900
Illinois		3,400
Iowa		450
Kentucky		670
Maine		75
Massachusetts		3,350
Minnesota		2,100
Montana		2,500
Nevada		1,800
New Mexico		7,200
New York—		
State engineer	$1,400	
Conservation commission	10,500	
		11,900
North Dakota		350
Oregon		11,000
South Dakota		960
Utah		4,100
Vermont		900
Washington		5,950
West Virginia		400
Wisconsin		8,800
Wyoming		1,600
		103,555

The work done under cooperative agreements in the several States has been limited to stream gaging, except as indicated below.

In addition to a large amount of stream gaging in California, investigations of ground water were made in San Diego County and in Sacramento and Santa Clara valleys, and measurements of depths to the ground-water level were made in southern California.

In Connecticut the cooperative work consisted chiefly of ground-water surveys.

In Hawaii, besides stream gaging, measurements of precipitation and studies of water losses in irrigation canals were made.

A compilation of stream-flow records in Oregon is now in press.

A detailed study of the water supply and the present and possible future use of Sevier River, Utah, begun in 1914, was still in progress at the end of the fiscal year.

In addition to the cooperative work tabulated above, in which the States have furnished part of the money for examinations made by the Survey staff, investigations of ground waters in cooperation with the agricultural experiment stations of New Mexico and Arizona were continued as in previous years, the experiment stations making analyses of samples of water and soluble salts collected.

Reclamation Service.—Cooperation with the Reclamation Service in stream gaging has been continued. The gaging stations operated at the expense of the reclamation fund are on streams that are to furnish water to reclamation projects under construction by that Service. The field work of stream gaging is done by Survey engineers who are engaged in such work in the locality, and repayment of actual cost is made by the Reclamation Service through a transfer of funds.

Office of Indian Affairs.—Investigations and reports have been made at the request of the Commissioner of Indian Affairs in connection with the classification of lands within Indian reservations with regard to water-power and reservoir sites and for the purpose of locating ground-water supplies, as follows:

The investigation of the occurrence and availability of ground water in the Hopi and Navajo reservations was completed during the year, and a report was prepared for publication.

A report was made on the possibility of developing water power on Hogback Canal, in T. 12 N., Rs. 1 and 2 W., and T. 13 N., R. 2 W., New Mexico meridian, in the Navajo Reservation.

An investigation was made to determine the practicability of developing ground-water supplies for irrigation on the San Carlos Reservation.

A report was made on the power-site and reservoir possibilities on the Wind River Reservation.

Stream gaging was continued on the following Indian reservations, in accordance with authorizations of the Office of Indian Affairs: Colville, Crow, Fort Hall, Klamath, La Pointe, Menominee, Pine Ridge, Queniult, Rosebud, San Carlos, Standing Rock, Warm Springs, and Yakima.

Public Health Service.—Special stream-gaging work in cooperation with the Public Health Service in connection with an investigation of the pollution of Ohio River, begun in the previous year, was completed.

United States Engineer Office.—Stream gaging in connection with navigation and flood studies in the Ohio basin is in progress in cooperation with the United States Engineer Office.

City of San Francisco.—Stream gaging is in progress on Tuolumne River, in cooperation with the city of San Francisco, in connection

with the utilization of the water of that river, to be stored in the Hetch Hetchy Valley as a water supply for the city.

PUBLICATIONS.

The publications prepared by the water-resources branch comprised 33 water-supply papers and 18 separate chapters. Titles and brief summaries of these publications are given on pages 449–457. At the close of the year 24 other reports were in press and 6 manuscripts were in hand awaiting editing.

GENERAL SUMMARY.

In the investigation of surface waters the water-resources branch has maintained 1,350 gaging stations for measuring the discharge of streams in 41 States and Hawaii. It is, however, only through extensive cooperation with States and other Federal organizations that the relatively large amount of work now in progress can be carried on. Twenty-six cooperating States (including Hawaii) have contributed more than $100,000 for work in those States, and the Reclamation Service, Indian Office, Army Engineers, and Public Health Service have also cooperated, largely in the study of the flow of particular rivers. The cooperating States include many Northern and Eastern States and all the States in the Rocky Mountain, Great Basin, and Pacific groups where water is necessary for agriculture by irrigation. At the close of the year gaging stations were being maintained at 1,350 points, including 129 in Hawaii. In addition, records were received from about 250 stations maintained by private enterprises. The resulting records of river discharge are published in an annual progress report consisting of 14 water-supply papers and in special water-supply papers.

Investigations of ground water have been made in 12 States, but the lack of funds prevents the comprehensive study of the occurrence, quantity, and quality that is commensurate with the importance of such water. This work should be greatly extended, especially in those sections of the arid States where further agricultural development can be made only by use of ground water. Several water-supply papers are published yearly containing the results of ground-water investigations.

Many investigations of the present and probable future use of both surface and ground waters have been made in connection with the classification of the public lands, with special reference to their use for power under permit or for agriculture under the enlarged-homestead, desert-land, or Carey acts. The results of such investigations appear generally in unpublished special reports to the Commissioner of the General Land Office and to the Secretary of the Interior.

G. K. Gilbert, geologist, who has worked under the joint auspices of the geologic and water-resources branches, revised and enlarged his report on the "Hydraulic mining débris of the Sierra Nevada, California." The field work necessary for this revision consisted of two series of current observations—one series made in the Golden Gate opposite Fort Point, for the purpose of ascertaining certain tidal constants which affect the estimates of movements of mining débris delivered by the rivers to the San Francisco Bay system, and one series made in a slough near Ravenswood, Cal., for the purpose of determining the quantity of tidewater received and delivered by marshlands. Mr. Gilbert received important aid in these observations from the Lighthouse Service, the United States Army engineers, and the United States Coast and Geodetic Survey.

DIVISION OF SURFACE WATERS.

ORGANIZATION.

The work of the division of surface waters consists primarily of the measurement of the flow of rivers, but includes also special investigations of conditions affecting stream flow and utilization of the streams. In carrying on the work the United States is divided into 16 districts, including Hawaii. Two of these districts were established during the year—New England, which was formed by dividing the North Atlantic district, and Arizona, which was formed by dividing the Arizona and New Mexico district. The New Mexico district was discontinued on June 30, 1915, and the work consolidated with that of the Rocky Mountain district. The following list gives the districts, names of the district engineers, and location of offices:

New England: C. H. Pierce, Customhouse, Boston, Mass.
New York: C. C. Covert, Federal Building, Albany, N. Y.
Middle Atlantic: G. C. Stevens, Washington, D. C.
South Atlantic and eastern Gulf: Warren E. Hall, Federal Building, Atlanta, Ga.
Ohio Valley: A. H. Horton, Federal Building, Newport, Ky.[1]
Upper Mississippi River: W. G. Hoyt, Capitol Building, Madison, Wis.; suboffice, Old Capitol Building, St. Paul, Minn.
Upper Missouri: W. A. Lamb, Montana National Bank Building, Helena, Mont.
Rocky Mountain: Robert Follansbee, Chamber of Commerce Building, Denver, Colo.
Great Basin: E. A. Porter, Federal Building, Salt Lake City, Utah.
Idaho: G. C. Baldwin, Idaho Building, Boise, Idaho.
Oregon: Fred F. Henshaw, Couch Building, Portland, Oreg.
Washington: G. L. Parker, Federal Building, Tacoma, Wash.
California: H. D. McGlashan, Customhouse, San Francisco, Cal.; suboffice, Federal Building, Los Angeles, Cal.
Arizona: C. C. Jacob, 417 Fleming Building, Phoenix, Ariz.
New Mexico: G. A. Gray, Capital City Bank Building, Santa Fe, N. Mex.
Hawaii: G. K. Larrison, Kapiolani Building, Honolulu.

[1] Office temporarily closed during the year; work conducted from Washington office.

Field investigations incident to the work are made from the district offices, where the results are sufficiently analyzed to insure their accuracy and completeness. At selected places, known as gaging stations, measurements of discharge are made and other data are collected from which the daily flow of the streams is computed. At the end of the year 1,350 gaging stations were maintained. During the year 408 stations were discontinued and 412 stations established. In addition, records ready for publication were received for about 250 stations from other Government bureaus and private persons. During the year 8,040 measurements of discharge were made. Many of the stations are maintained in cooperation with other Federal bureaus, State organizations, or private persons.

The following table shows the distribution of the stations and measurements by States and the number of stations maintained by cooperating parties:

Report of gaging stations and cooperating parties for the year ending June 30, 1915.

State.	Geological Survey alone.	Reclamation Service.	Forest Service.	Indian Office.	Army Engineers.	Weather Bureau.	Other Federal bureaus.	State cooperation.	Municipal cooperation.	Private persons.	Counted more than once.	Maintained at end of year.	Established during year.	Discontinued during year.	Regular gagings during year.	Miscellaneous gagings during year.
Alabama	....	....	....	....	1	....	....	4	....	....	....	5	....	1	6	....
Arizona	....	3	....	4	2	....	....	18	....	2	4	25	1	2	432	34
California	....	7	41	2	....	2	3	166	14	55	119	171	21	13	1,225	198
Colorado	3	....	29	....	....	1	....	12	....	5	2	48	6	18	208	3
Connecticut	....	....	....	....	....	....	....	1	....	....	....	1	1	2	14	3
Georgia	2	....	....	....	....	4	....	....	3	11	2	18	6	....	88	6
Idaho	5	10	7	10	....	3	....	....	1	28	....	64	3	32	303	41
Illinois	....	....	....	....	....	1	....	24	....	....	....	25	30	6	158	8
Indiana	....	....	....	....	....	1	....	....	....	1	....	2	1	....	1	1
Iowa	....	....	....	....	....	2	....	14	....	....	2	14	13	10	32	....
Kentucky	....	....	....	....	....	1	....	5	....	....	....	6	5	....	7	4
Maine	....	....	....	....	....	....	....	14	....	8	....	22	25	3	19	....
Maryland	3	....	....	....	....	....	....	....	....	....	....	3	....	....	19	....
Massachusetts	....	....	....	....	....	....	....	11	....	7	1	17	7	2	84	20
Michigan	....	....	....	....	....	....	....	1	1	3	....	5	....	....	....	....
Minnesota	....	....	....	....	2	2	1	28	....	1	6	28	4	13	111	1
Montana	11	55	16	7	....	1	2	20	....	1	1	112	2	16	385	25
Nebraska	....	....	....	....	....	....	....	....	....	....	....	....	....	13	....	....
Nevada	....	5	....	2	....	1	....	38	....	15	19	42	21	39	286	97
New Hampshire	....	....	....	....	....	....	....	....	....	5	....	5	1	....	14	....
New Jersey	1	....	....	....	....	....	....	....	....	....	....	1	....	1	1	....
New Mexico	....	6	2	2	....	....	....	10	....	11	1	30	3	41	362	5
New York	....	....	....	....	1	3	....	40	1	5	10	40	3	3	264	58
North Carolina	2	....	....	....	....	1	....	....	....	8	....	11	....	1	9	....
North Dakota	....	....	....	1	....	....	....	7	....	....	....	8	....	....	32	....
Ohio	1	....	....	....	5	....	1	....	1	....	....	8	5	1	17	6
Oklahoma	....	4	....	....	....	....	....	....	....	....	....	4	1	....	2	....
Oregon	5	1	4	5	1	4	1	20	3	44	....	88	31	45	345	169
Pennsylvania	....	....	....	....	....	....	....	....	....	....	....	....	....	3	2	4
Rhode Island	....	....	....	....	....	....	....	....	....	1	....	1	1	....	....	....
South Carolina	....	....	....	....	....	....	1	....	....	....	....	1	1	....	14	....
South Dakota	....	....	....	4	....	....	....	2	....	....	....	6	3	2	55	2
Tennessee	2	....	....	....	....	3	....	....	....	4	....	9	4	....	21	5
Texas	2	4	....	....	....	6	....	....	1	....	....	13	10	1	115	3
Utah	....	4	2	....	....	....	....	132	....	83	89	131	83	95	938	86
Vermont	....	....	....	....	....	....	....	7	....	2	1	8	4	6	26	8
Virginia	8	....	....	....	....	1	....	....	....	4	....	13	1	1	24	....
Washington	7	22	8	12	....	....	2	6	1	31	1	88	18	20	378	32
West Virginia	18	....	....	....	13	1	....	7	....	....	....	39	16	1	71	4
Wisconsin	....	....	....	3	1	....	....	46	....	15	19	46	8	4	297	3
Wyoming	....	6	1	....	....	1	4	54	....	....	2	63	50	3	158	14
Hawaii	....	....	....	....	3	....	....	129	....	56	59	129	23	10	496	169
Total	70	127	110	52	29	39	15	816	26	406	338	1,350	412	408	7,029	1,011

NOTE.—Total for Hawaii June 30, 1914, should have been 116 instead of 141.

Results of field data collected from the district offices are transmitted to the Washington office, where they are reviewed in the computing section and prepared for publication. This review insures accuracy in the data and brings the results from different parts of the country to a uniform standard. Regular field inspections are made and annual conferences of the engineers are held, whereby the work in the several districts is standardized.

PUBLICATIONS.

For convenience and uniformity in publication the United States has been divided into 12 primary drainage basins, as shown in the following table, and the results of stream measurements are published annually in a series of progress reports that correspond to these 12 divisions. Prior to 1914 the records for each division were contained in a single water-supply paper; beginning with 1914 the reports for the twelfth division will be published as three separate papers.

In 1913 a seasonal or climatic year—October 1 to September 30—was adopted for the presentation of reports on regions west of the Rocky Mountains and on upper Mississippi and Ohio rivers; in 1914 the use of the climatic year was extended to all districts.

Numbers of water-supply papers containing results of stream measurements, 1910–1914.

Part—	Area.	1910	1911	1912	1913	1914
I	North Atlantic	281	301	321	351	381
II	South Atlantic and eastern Gulf of Mexico	282	302	322	352	382
III	Ohio River	283	303	323	353	383
IV	St. Lawrence River and Great Lakes	284	304	324	354	384
V	Hudson Bay and upper Mississippi River	285	305	325	355	385
VI	Missouri River	286	306	326	356	386
VII	Lower Mississippi River	287	307	327	357	387
VIII	Western Gulf of Mexico	288	308	328	358	388
IX	Colorado River	289	309	329	359	389
X	Great Basin	290, 291	310	330	360	390
XI	California	291	311	331	361	391
XII	North Pacific	292	312	332	362	.....
	Pacific basins in Washington and upper Columbia River	.....	.....	332-A	362-A	392
	Snake River basin	.....	.....	332-B	362-B	393
	Lower Columbia River and Pacific basins in Oregon	.....	.....	332-C	362-C	394

In addition to the regular progress reports, special reports on various hydraulic subjects have been completed for publication during the year, as is indicated in the list on pages 449–458.

DIVISION OF GROUND WATERS.

SCOPE OF WORK.

The main function of the division of ground waters is to make a survey of the underground waters of the country with reference to their utilization. The investigations of each year form part of a comprehensive plan that includes the entire country. Because of

the great interest throughout the West in irrigation with ground water and the prospects for considerable developments of this kind, most of the work has been done in the arid and semiarid States and with special reference to irrigation.

The chemical investigations, which are under the supervision of R. B. Dole, cover both surface and ground waters. Progress was made in the preparation of a comprehensive report on the chemical composition of the surface waters of the United States by Mr. Dole, assisted by E. C. Bain, C. D. Parker, and A. A. Chambers. The chapter on the production of mineral waters for the annual volume Mineral Resources of the United States, with a history of the mineral-water trade of the United States since 1883, was prepared by Mr. Dole. Maps and manuscripts for geologic folios were reviewed so far as they related to ground water.

Nearly 40 investigations of ground water or quality of water (including the reports in press) were in progress, covering areas in Arizona, Arkansas, California, Connecticut, Florida, Georgia, Idaho, Maine, Mississippi, Montana, Nevada, New Mexico, Oregon, Texas, and Washington. The work in Arkansas, Florida, Georgia, Mississippi, and Texas was done in cooperation with the section of Coastal Plain investigations of the geologic branch, and the work in Idaho was done by the division of water utilization. During the year 11 reports were completed and 10 were published.

WORK BY STATES.

Arizona.—A comprehensive report on the ground water of the Hopi and Navajo Indian reservations, in Arizona and adjacent parts of New Mexico and Utah, was completed by H. E. Gregory, who has been in charge of the investigation since its beginning in 1909. The report will be published as Water-Supply Paper 380. The ground-water conditions of an area west of Little Colorado River have also been investigated by Prof. Gregory, and a report covering the area is in preparation. Both investigations were made in cooperation with the Office of Indian Affairs.

By direction of the Secretary of the Interior, an investigation of the ground water in Paradise Valley, with special reference to its utilization for irrigation, was made by O. E. Meinzer and A. J. Ellis. A report on this investigation was completed and sent to press to be published as Water-Supply Paper 375–B. Analyses of water from this valley were made by the Arizona Agricultural Experiment Station.

An investigation of the ground water in the San Carlos Reservation with respect to its availability for irrigation was undertaken for the Office of Indian Affairs by A. T. Schwennesen, who completed the field work and is now preparing a report.

A short time was spent by Mr. Schwennesen in the San Simon Valley for the purpose of obtaining data on the yield and pressure of artesian wells in that valley. The San Simon investigation was begun in 1913 and was resumed in the summer of 1915. The water analyses are made by the Arizona Agricultural Experiment Station, through the cooperation of R. H. Forbes, director.

Arkansas.—The report on the geology and underground-water resources of eastern and northeastern Arkansas, by L. W. Stephenson and A. F. Crider, with a discussion of the chemical character of the waters by R. B. Dole, was completed by the authors before the beginning of the fiscal year and is being prepared for the printer. It is to be published as a water-supply paper.

California.—A comprehensive report on the springs of California, by G. A. Waring, was published as Water-Supply Paper 338. It is based on extensive field work done by Mr. Waring in earlier years.

The field work for the ground-water survey of the Sacramento Valley, which was begun in September, 1912, was continued by Kirk Bryan, assisted by J. W. Muller, and was completed about January 1, 1915. A preliminary report by Mr. Bryan on ground water for irrigation in the Sacramento Valley was published as Water-Supply Paper 375–A, and considerable work was done on the maps and manuscript for the final report on the region.

Good progress was made during the year by W. O. Clark in the ground-water survey of the Santa Clara Valley, on which he has been engaged since August, 1912. A report on the ground-water resources of the Niles cone, which is a part of the Santa Clara Valley, was prepared by Mr. Clark and was published as Water-Supply Paper 345–H.

The final report on ground water in the San Joaquin Valley, by W. C. Mendenhall, R. B. Dole, and Herman Stabler, was completed and sent to the printer to be published as Water-Supply Paper 398. Some work was also done by W. C. Mendenhall and G. A. Waring on the San Jacinto Valley investigation.

An investigation of the ground-water resources of the part of San Diego County lying west of the divide was undertaken by A. J. Ellis and C. H. Lee, and most of the field work and considerable of the office work was completed. The results are to be embodied in a comprehensive report on the water resources of the county. The analytical work was done by S. C. Dinsmore. Financial cooperation was furnished by the city of San Diego.

Since 1900 measurements of depths of the water level in a series of wells in southern California have been made at intervals for the purpose of obtaining a record through many years of the relations between the contributions to the underground reservoirs in the rainy

seasons and the withdrawals from them in the dry seasons, when ground water is pumped for irrigation and when evaporation and transpiration are most rapid. Most of the records for the period prior to 1909 have been published in Water-Supply Papers 213 and 251; the records for 1909, 1910, and 1912, together with a brief discussion by W. C. Mendenhall, were published during the year in Water-Supply Paper 331. The work is at present being carried on by F. C. Ebert, who has selected companion wells and otherwise improved the methods. Mr. Ebert has also made progress in the tabulation of all available water-level data for the region.

All the ground-water work in California is supported by financial cooperation of the State Department of Engineering.

Connecticut.—The report on ground water in the Hartford, Stamford, Salisbury, Willimantic, and Saybrook areas, by H. E. Gregory and A. J. Ellis, which was completed before the beginning of this fiscal year, is now in press as Water-Supply Paper 374.

The report on ground water in the Waterbury area, by A. J. Ellis, was completed during the year and was sent to the printer to be published as Water-Supply Paper 397.

An investigation of the relations between precipitation, ground-water storage, evaporation, and run-off in the Pomeraug Valley, begun in July, 1913, by A. J. Ellis, was continued, observations being made regularly during the year and the data tabulated and plotted.

A ground-water survey of the Meriden area was made by G. A. Waring, and 25 samples of water were collected for mineral analysis.

A ground-water survey of the Plainville area was made by H. S. Palmer, and at the close of the year work was in progress in other towns in the northeastern section of the State.

All the work in Connecticut is done in cooperation with the State Geological and Natural History Survey, W. N. Rice, superintendent, and is under the supervision of H. E. Gregory. The results of the various surveys will be published in water-supply papers.

Florida.—Some progress was made during the year on the investigation of the quality of ground waters in Florida, and work on this project is to be resumed by Mr. Dole in the near future. Daily samples of sea water from Fowey Rocks Light were tested for chlorine content in connection with Mr. Vaughan's study of oceanographic phenomena on the Florida coast.

Georgia.—The report on the ground waters of the Coastal Plain of Georgia, by L. W. Stephenson and J. O. Veatch, with a discussion of the chemical character of the waters by Mr. Dole, was published as Water-Supply Paper 341. The investigation on which this report is based was conducted in cooperation with the Georgia Geological Survey.

Idaho.—An investigation of the ground water in the Fort Hall Indian Reservation was made by W. B. Heroy, and a report prepared by him was incorporated in a general paper on the geology and resources of the region which is to be published as a bulletin.

At the request of the division of drainage investigations, Department of Agriculture, an examination of water-level problems on irrigated lands in the vicinity of Twin Falls was made by Mr. Heroy, and a manuscript report by him on the causes and cure of the rising water levels was transmitted to the Department of Agriculture.

Maine.—At the request of the Secretary of the Navy, a brief examination of available water supplies in the vicinity of the Portsmouth Navy Yard was made by O. E. Meinzer.

Mississippi.—The division of ground water continued its cooperation with the section of Coastal Plain investigations of the geologic branch in the general investigation of ground water in Mississippi. (See pp. 50–51.) The analytical work was supervised by Mr. Dole.

Montana.—The report on the water resources of Butte, Mont., by O. E. Meinzer, was published as Water-Supply Paper 345–G.

Through the cooperation of the division of surface waters and A. W. Mahon, State engineer of Montana, steps were taken near the close of the year to collect the records of the most important wells in the State.

Nevada.—The report on ground water in southeastern Nevada by Everett Carpenter was published as Water-Supply Paper 365.

Additional field work was done by O. E. Meinzer in Big Smoky Valley, chiefly on the contributions of the streams to the underground supply. A preliminary report on this valley was prepared and sent to the printer to be published as Water-Supply Paper 375–D. The final report on the geology and water resources of Big Smoky, Clayton, and Alkali Spring valleys was completed by Mr. Meinzer. The chemical work was done by S. C. Dinsmore.

Near the close of the year an investigation of water levels on the Truckee-Carson project was undertaken for the Department of Justice by C. H. Lee and W. O. Clark.

New Mexico.—The report on the Tularosa Basin and adjacent areas, by O. E. Meinzer and R. F. Hare, prepared in cooperation between the New Mexico Agricultural Experiment Station and the Survey, was published as Water-Supply Paper 343.

Work on the ground-water resources of southern Grant County, including the Animas, Playas, and Hachita valleys, was continued by A. T. Schwennesen, of the Survey, and Mr. Hare, of the experiment station, and at the close of the fiscal year the report was nearly completed.

The report on ground water in the Hopi and Navajo reservations, by H. E. Gregory, covers a part of northwestern New Mexico. (See Arizona, p. 566.)

A number of samples of water collected by Mr. Schwennesen in Luna County were analyzed by Mr. Hare at the experiment station.

Oregon.—The report on the quality of surface waters of Oregon, by Walton Van Winkle, prepared in cooperation with J. H. Lewis, State engineer of Oregon, was published as Water-Supply Paper 363.

Texas.—The work in Texas was done in cooperation with the section of Coastal Plain investigations, geologic branch, and was confined to the Coastal Plain.

The report on the geology and underground waters of the southeastern part of the Texas Coastal Plain, by Alexander Deussen, was published as Water-Supply Paper 335.

A report on the ground-water supply of Lasalle and McMullen counties, by Alexander Deussen and R. B. Dole, was completed and is to be published as Water-Supply Paper 375–G.

Work was continued on the ground-water resources of the part of the Texas Coastal Plain not covered by Water-Supply Paper 335, and two papers are being prepared.

Washington.—The report on the quality of the surface waters of Washington, prepared by Walton Van Winkle in cooperation with the State board of health, was published as Water-Supply Paper 339.

DIVISION OF WATER UTILIZATION.

The organization of the division of water utilization has been continued during the year, as described in previous annual reports. E. C. La Rue and E. C. Murphy, hydraulic engineers, have done the greater part of the field work involved in the examination of water-power withdrawals, rights of way, and Carey Act segregations. The work of examining land for designation under the enlarged-homestead act has been done in part by Messrs. La Rue and Murphy and in part by W. B. Heroy, geologist, and W. N. White, assistant classifier, in the land-classification board, who were detailed to the work during a portion of the field season. In addition to routine field work, Mr. La Rue has devoted about six months to the preparation of a manuscript relative to the present and probable future utilization of Colorado River for irrigation, power, and navigation. The report is practically complete and will be published as Water-Supply Paper 395. Mr. Murphy has made a field examination of the possibilities of water-power and reservoir development in Arizona and in the Gila drainage basin in New Mexico in order that lands valuable for such purposes may be designated in accordance with the act of Congress admitting Arizona and New Mexico to statehood. Reports based on these examinations were completed late in the year.

LAND-CLASSIFICATION BOARD.

ORGANIZATION.

Since the land-classification board became a separate branch, on May 1, 1912, its organization and its functions have remained practically stable. The work of the board consists of the receipt from the field branches of the results of investigations made for or adaptable to public-land classification and the transformation of those results into actual classifications, which become the basis of that part of the Department of the Interior's administration of the public-land laws that depends on the character of the lands.

The geologic branch, for example, examines the coal lands of the public domain. The results of the field examination are prepared in accordance with regulations and suggestions formulated by the board and are transmitted to it for use in making reports on the character of the lands or in preparing withdrawals, restorations, or valuations, as may be required. The geologic branch also studies the oil fields of the public domain and likewise reports the results, and after a careful consideration of these results by the land-classification board, the Director transmits to the Secretary of the Interior appropriate recommendations for the creation of petroleum reserves or for their cancellation, or takes any other appropriate action that will assist in the administration of the public-land laws applying to oil.

The topographic branch furnishes a share of the field data that form the basis of classification, not merely by the preparation of general topographic maps and the accompanying classification plats, which permit a study of drainage areas and irrigation possibilities, but by special profile surveys of streams that appear to have power value. These surveys enable the board to make close classification of lands according to their power value, and are valuable in the administration of the laws that control water-power development.

The water-resources branch, by its general work in the gaging of streams, is constantly assembling data essential to the classification of lands both as to power value and as to irrigability. Its ground-water division ascertains facts that are used in the classification required by the enlarged-homestead acts, and its division of water utilization makes examinations that furnish the groundwork necessary for the public-land classifications required by the laws which provide for the disposal of lands through the use of water.

The classifications required by our public-land laws fall into two broad groups—a group dependent on the presence or absence of mineral deposits in the land and a group dependent on the presence or absence of water. The board, in its organization, following this natural grouping of its problems, is composed of two divisions, a division of mineral classification and a division of hydrographic

classification. Sections are organized within each division to deal with each of the major subjects with which the division deals. The organization in outline is as follows:

W. C. Mendenhall, chief.
Elsie Patterson, secretary.
Division of mineral classification: Coal section, G. H. Ashley, chairman; E. R. Lloyd, vice chairman. Oil section, M. W. Ball, chairman. Phosphate section, A. R. Schultz, chairman. Metalliferous section, A. R. Schultz, chairman.
Division of hydrographic classification: Section of utilization, Herman Stabler, chairman. Section of classification, W. B. Heroy, chairman.

The staff of the board during the year, although it has varied because of temporary assignments made from time to time, has averaged about 37 persons, of whom 8 are geologists, 8 engineers, 3 draftsmen, 16 clerks of various grades, and 2 messengers. Several changes in the personnel have resulted from assignments of members of the board staff to other branches of the Survey and of assignments to the board to fill vacancies thus created or to take up work not heretofore adequately provided for.

FUNDS.

One of the primary functions of the Geological Survey specifically mentioned in "the organic act" approved March 3, 1879, is the classification of the public lands. Each of the three field branches of the organization, the geologic, the topographic, and the water resources, spends a part of its appropriation in field examinations whose results are submitted to the board for use in official land classification. Specific allotments for the board's office work are made by the Director from the general appropriations. These allotments for the fiscal year 1915 amounted to $58,000 and were distributed among the general appropriations as follows:

Geologic surveys	$31,500
Topographic surveys	11,500
Gaging streams	11,000
Salaries of scientific assistants	4,000
	58,000

GENERAL FEATURES OF THE WORK.

The field examinations made for coal-land classification during the last nine years have covered approximately the following areas in townships, a township comprising 23,040 acres.

Areas examined for coal-land classification by fiscal years from 1907 to 1915, measured in townships.

	Townships.		Townships.		Townships.
1907	296	1910	322	1913	188
1908	583	1911	339	1914	183
1909	443	1912	358	1915	96

The area remaining in coal withdrawals at the end of the fiscal year amounts, roughly, to 2,100 townships, which at the rate of examination this year will require about 22 years for classification.

The classifications of oil, potash, and metalliferous mineral lands during the year have affected smaller areas and the phosphate classifications somewhat larger areas than during preceding years. Most of the public lands in which the possibilities of the existence of valuable deposits of petroleum, phosphate, and potash are considered favorable have already been withdrawn, so that the field work of 1914–15 revealed relatively small additional promising areas, except as to phosphate. The tracing of the phosphate-bearing rocks around the west end of the Uinta Mountains in Utah added considerably to the phosphate territory heretofore known. The greater part of the nonoil and nonpotash lands had been eliminated from the reserves of those minerals as a result of earlier work. Consequently the changes in the areas reserved because of these resources have been relatively slight. Large eliminations were made from the phosphate withdrawals as a result of detailed mapping of parts of the reserves. These changes are summarized in the following table:

Lands withdrawn and restored to entry during the fiscal year ended June 30, 1915.

	Withdrawn.	Restored.
	Acres.	*Acres.*
Oil	197,073	180,818
Phosphate	273,221	454,894
Potash	119,224	2,880

Classification discriminating metalliferous from nonmetalliferous lands during the year covered nearly 1,000,000 acres, chiefly of Indian lands in Washington, Idaho, Arizona, and California. Much the greater part of this area proved to be nonmineral land.

The first great designations of land as nonirrigable for entry under the enlarged homestead acts were made promptly upon the passage of the first act—the act of February 19, 1909 (35 Stat., 639). Large areas were designated during the two succeeding years; small areas were added during 1912 and 1913, when the regulations required that only unpatented lands might be designated; and large areas have been designated during the last two years as a result of the increasing demand and the application of the law to several new States. The gross designations made each fiscal year since the passage of the act are indicated in the accompanying table.

Lands designated as irrigable or nonirrigable during the fiscal years 1909–1915.

	Acres.		Acres.
1909	161,428,184	1913	2,323,612
1910	18,383,201	1914	33,102,289
1911	11,030,598	1915	17,485,259
1912	1,201,513		

The increasing demand for this work and the responses that the board's limited force has been able to make to this demand are indicated in the following table of petitions for designation received during each year since the passage of the act and the number of the requests acted upon:

Petitions for designation of irrigable or nonirrigable lands received and acted on, 1909–1915.

Year.	Received.	Acted on.
1909	89	49
1910	256	245
1911	248	162
1912	511	299
1913	1,944	946
1914	5,709	5,359
1915	5,666	3,996

On June 30, 1915, there were 3,327 petitions pending and under consideration.

The changes during the year in the areas withdrawn as valuable for power development have been relatively small, the new withdrawals during the year aggregating 292,134 acres and the restorations 55,646 acres, the total area included in power site reserves at the end of the year being 2,228,105 acres.

SUMMARY.

No coal lands were withdrawn during the year, but 2,363,646 acres were restored, leaving outstanding withdrawn at the end of the year 48,244,274 acres. There was a decrease of 113,088 acres during the year in the area of coal land to which values had been given. This decrease is due to a reclassification as noncoal of certain areas heretofore classified as coal land and appraised. At the end of the year 19,489,771 acres had been valued at an average price of $40.60 an acre.

During the year 197,073 acres of oil land were withdrawn and 180,818 acres of nonoil land eliminated from withdrawals, leaving the net area included in oil withdrawals at the end of the year 4,774,418 acres.

The phosphate classifications during the year resulted in a withdrawal of 273,221 acres and a restoration of 454,894 acres, leaving the net area outstanding at the end of the year 2,660,376 acres.

During the year 119,224 acres were withdrawn for potash explorations and 2,880 acres were eliminated from existing withdrawals, leaving the withdrawn area at the end of the year 342,013 acres. On the basis of containing metalliferous minerals 967,210 acres, chiefly in Indian reservations, were classified. Of this total 929,916 acres were classified as nonmineral and 37,294 acres as mineral land. The

rawals of land valuable for power sites during the yea
to 292,134 acres, the restorations to 55,646 acres, leavin
ithdrawn at the end of the year for this purpose 2,228,10
ring the year 17,485,259 acres were classified as nonirrigabl
designated for entry under the enlarged-homestead ac
area thus designated at the end of the year amounted t
) acres.

NEW LEGISLATION.

he fiscal year that ended June 30, 1915, several acts an
ts to acts were passed which affect the work of classifyin
lands. One of the most important of these was the act o
14 (38 Stat., 509), which provides for "the appropriation
lection, entry, or purchase" under the nonmineral lan
lands withdrawn, classified, or valuable for phosphate
ash, oil, gas, or asphaltic minerals with the reservation t
States of the minerals for which the lands are withdraw
able. This act supplements the acts of March 3, 190
14), June 22, 1910 (36 Stat., 583), and April 30, 1912 (3
providing for nonmineral entry on coal lands, and per
tural entry and development on practically all lands now
mineral reserves, which constitute much the greater por
total areas withdrawn under the act of June 25, 1910 (36

area withdrawn on June 30, 1915, was 58,494,844 acres
l all the lands included in coal, oil, phosphate, and potash
gregating 56,021,081 acres, may now be entered under the
land laws, the remaining withdrawals of miscellaneous
gating 2,473,763 acres, being not yet subject to agricul-
The passage of these acts thus greatly reduced the inter-
he withdrawal policy with agricultural development and
ll further reduced by a provision for agricultural entry of
wer-site reserves with a reservation of all water-power
e Government. Legislation of this type has been advo-
e department, and such a provision has been included in
ill (H. R. 16673, 63d Cong., 3d sess.).

laws, or amendments to old laws, were passed at the
third session of the Sixty-third Congress, which very
fect the rights of homesteaders and the procedure under
-homestead acts. The act of March 3, 1915 (38 Stat.,
ction 2 of the act of March 4, 1915 (38 Stat., 1163), ex-
residence provisions of the enlarged-homestead acts to
al States, namely, Kansas and South Dakota, so that
w apply to 14 States. The amendment of March 3, 1915
6), the act of March 4, 1915 (38 Stat., 1162), and section 1

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new withdrawals of land valuable for power sites during the year amounted to 292,134 acres, the restorations to 55,646 acres, leaving the area withdrawn at the end of the year for this purpose 2,228,105 acres. During the year 17,485,259 acres were classified as nonirrigable and were designated for entry under the enlarged-homestead act. The total area thus designated at the end of the year amounted to 235,596,180 acres.

NEW LEGISLATION.

During the fiscal year that ended June 30, 1915, several acts and amendments to acts were passed which affect the work of classifying the public lands. One of the most important of these was the act of July 17, 1914 (38 Stat., 509), which provides for "the appropriation, location, selection, entry, or purchase" under the nonmineral land laws of all lands withdrawn, classified, or valuable for phosphate, nitrate, potash, oil, gas, or asphaltic minerals with the reservation to the United States of the minerals for which the lands are withdrawn or are valuable. This act supplements the acts of March 3, 1909 (35 Stat., 844), June 22, 1910 (36 Stat., 583), and April 30, 1912 (37 Stat., 105), providing for nonmineral entry on coal lands, and permits agricultural entry and development on practically all lands now included in mineral reserves, which constitute much the greater portion of the total areas withdrawn under the act of June 25, 1910 (36 Stat., 847).

The total area withdrawn on June 30, 1915, was 58,494,844 acres. Of this total all the lands included in coal, oil, phosphate, and potash reserves, aggregating 56,021,081 acres, may now be entered under the nonmineral land laws, the remaining withdrawals of miscellaneous types, aggregating 2,473,763 acres, being not yet subject to agricultural entry. The passage of these acts thus greatly reduced the interference of the withdrawal policy with agricultural development and it can be still further reduced by a provision for agricultural entry of lands in power-site reserves with a reservation of all water-power rights to the Government. Legislation of this type has been advocated by the department, and such a provision has been included in the Ferris bill (H. R. 16673, 63d Cong., 3d sess.).

Four new laws, or amendments to old laws, were passed at the close of the third session of the Sixty-third Congress, which very definitely affect the rights of homesteaders and the procedure under the enlarged-homestead acts. The act of March 3, 1915 (38 Stat., 953), and section 2 of the act of March 4, 1915 (38 Stat., 1163), extended the residence provisions of the enlarged-homestead acts to two additional States, namely, Kansas and South Dakota, so that these acts now apply to 14 States. The amendment of March 3, 1915 (38 Stat., 956), the act of March 4, 1915 (38 Stat., 1162), and section 1

of the act of March 4, 1915 (38 Stat., 1163), constitute a series of supplementary acts which together form important new legislation affecting homesteaders and the administration of the enlarged-homestead laws. Before these acts were passed, homestead entrymen who had received final certificates or patents on 160-acre homesteads were barred from participation in the advantages of the enlarged-homestead laws. Applicants for designations under these laws secured no recognized rights or equities by virtue of their application, and before the desired additional land could be classified it might be acquired under the ordinary homestead laws by another entryman and the applicant under the enlarged-homestead act be left without remedy. The amendment of March 3, 1915 (38 Stat., 956), provides that any homestead entryman who, although he may have submitted final proof or received patent to his entry, still owns and occupies the land entered shall have the right to enter a tract contiguous to the original entry, provided that the two entries together shall not exceed 320 acres in area. Section 1 of the amendment of March 4, 1915 (38 Stat., 1163), provides that an application to enter lands under the enlarged-homestead acts shall operate to reserve these lands from other entry until the Secretary of the Interior shall have determined whether they are subject to acquisition under the enlarged-homestead act. If his decision is favorable and he designates the land, the applicant shall then have a preference right to enter the lands. This series of supplementary laws is completed by the act of March 4, 1915 (38 Stat., 1162), which provides that enlarged homestead entries which were pending on January 1, 1914, but were invalid because title to the original entry had already been acquired under the homestead laws, are validated if the original entry was for less than 160 acres.

Since the act of March 4, 1915, provides that those who desire to secure a preference right to entry, subject to the designation by the Secretary of the Interior of the lands as nonirrigable, must file their applications with the register and receiver of the land district in which the land desired is located, and since the majority of the applicants under the enlarged-homestead laws desire to take advantage of the preference right feature of this law, most of the applications are now received through the General Land Office instead of directly by the Geological Survey or the Secretary's office as heretofore. The General Land Office and the Geological Survey have provided for this new procedure. Regulations have been prepared and issued defining it and a circular on the subject may be obtained at local land offices by applicants who desire to take advantage of this act.

CORRESPONDENCE.

During the fiscal year just closed 19,151 letters were referred to the board, an increase of about 23 per cent over the preceding year. In addition, about 6,000 copies of letters from other bureaus were sent to the board for its information and files. During the same period 18,457 letters, reports, acknowledgments, and notifications were prepared in the board, an average of about 63 incoming and 60 outgoing pieces of mail for each working day of the year.

PUBLICATIONS.

During the year a bulletin entitled "Petroleum withdrawals and restorations affecting the public domain" has been prepared by Max W. Ball and Lucetta W. Stockbridge and submitted for publication. This bulletin gives true and accurate copies of all petroleum withdrawals and restorations. It contains chapters on purpose of the withdrawals, history of the withdrawals, oil-land law, and orders and correspondence, and is illustrated by seven maps. No bulletin of this kind has ever been published, and it is believed that it will be of great value to the Survey, to the Land Office, and to individuals interested in the oil industry in the public-land States.

COOPERATION WITH THE GENERAL LAND OFFICE.

The cooperation between the General Land Office and the Geological Survey through which the Survey's information on the mineral and power value of lands sought under the public-land laws is made available to the department, through the General Land Office, was partly suspended during the fiscal year 1913–14 because the land board's staff and allotments were insufficient to keep the work current. As a consequence of the suspension the cases awaiting action in the Survey were nearly all disposed of by the beginning of the fiscal year 1915 and cooperation was resumed in part soon thereafter. As a result of this resumption, the Survey received during the year 9,046 requests from the General Land Office for information as to the mineral character or the relations to water supplies of public lands sought, and it furnished information in 7,364 cases. It also received 2,710 reports of the field examiners of the Land Office for consideration, and it acted on 2,576 reports of this character.

The following table shows the year's record in the several classes of cooperative cases, including those discussed and including also requests for the designation of lands under the enlarged-homestead act. With the passage of the preference-right act (38 Stat., 1163) and the tendency as a consequence to file enlarged-homestead petitions in the local land offices instead of in the Geological Survey, this type of work comes to resemble more closely, in the manner in which it is handled, the other cooperative work between the two bureaus.

General summary of cooperative cases for the fiscal year 1915.

Classes of cases.	Pending July 1, 1914	Received during fiscal year.	Disposed of during fiscal year.	Pending June 30, 1915.	Gain (+) or loss (−).
Mineral character only:					
General Land Office requests for information	12	451	283	180	− 168
General Land Office field service reports	85	1,458	1,387	156	− 71
Applications for reclassification as to coal	0	10	9	1	− 1
Applications for classification as to coal	3	18	17	4	− 1
	100	1,937	1,696	341	241
Water resources only:					
General Land Office requests for information	14	125	118	21	− 7
General Land Office field service reports	16	67	65	18	− 2
Cases in national forests	2	67	63	6	− 4
Applications for reclassification as to water resources	13	49	51	11	+ 2
Applications for rights of way	110	460	465	105	+ 5
Lists under Carey Act	0	7	6	1	− 1
Petitions under enlarged-homestead act	1,657	5,666	3,996	3,327	−1,670
Desert-land proofs under irrigation projects	119	151	180	90	+ 29
	1,931	6,592	4,944	3,579	−1,648
Mineral character and water resources:					
General Land Office requests for information	137	7,944	6,382	1,699	−1,562
General Land Office field service reports	60	659	643	76	− 16
General Land Office requests for information as to water resources, accompanied by field service reports as to mineral character	36	526	481	81	− 45
Indian Office requests for information	35	123	148	10	+ 25
	268	9,252	7,654	1,866	−1,598
	2,299	17,781	14,294	5,786	−3,487

MINERAL CLASSIFICATION.

COAL.

Regulations.—The regulations governing the classification and valuation of coal lands approved by Secretary Fisher February 20, 1913,[1] have continued in force during the fiscal year, except that by a decision of Secretary Lane on February 16, 1915, the last part of paragraph 2 was revoked, the department holding that legally classification of coal land must be made by quarter quarter sections and surveyed lots and not by minor subdivisions of 2½ or 10 acres. In the comparatively short time that these regulations have been in force they have proved the soundness of the principles underlying them. Certain modifications may become necessary as knowledge of the chemistry of coal is increased and as further statistics are collected bearing on cost of mining and other factors affecting the value of coal lands. The regulations as they now stand furnish what is believed to be a sound and conservative standard for the classification and valuation of land underlain by coal of any quality or thickness.

Withdrawals and restorations.—No withdrawals of coal land were made during the year. The policy of reducing the outstanding withdrawals was continued in so far as the data available and the demands of other work would permit.

[1] U. S. Geol. Survey Bull. 537, pp. 96–97, 1913.

Classifications.—During the last year, as in previous years, every effort has been made to obtain information with regard to withdrawn areas which were believed to be largely noncoal land in order that, as rapidly as possible, those areas might be eliminated from the withdrawals. The results in acreage classified—2,902,628 acres—are far below those of previous years, partly because of the previous elimination from withdrawal of the larger noncoal areas and a consequent restriction of field examination to more detailed work on coal lands, but chiefly because of the short season of field work in 1914. Reexamination of parts of Wyoming, Colorado, and Utah which had previously, on very meager evidence, been classified as coal land resulted in the reclassification of large areas, so that the net result of the classifications during the fiscal year is a reduction of outstanding classified coal lands by 24,568 acres.

In the following four tables the results of restorations, classifications, and appraisals during the year are summarized by States:

Coal land restored during the fiscal year 1915, in acres.

State.	Outstanding July 1, 1914.	Restorations during fiscal year.	Outstanding June 30, 1915.
Arizona	118,718	.....	118,718
California	17,764	121	17,643
Colorado	4,746,663	137,097	4,609,566
Idaho	338,452	.....	338,452
Montana	14,203,365	1,204,250	12,999,115
Nevada	83,833	.....	83,833
New Mexico	5,549,883	126,228	5,423,655
North Dakota	15,202,533	465	15,202,068
Oregon	26,561	.....	26,561
Utah	5,988,064	291,448	5,696,616
Washington	1,380,928	533,036	847,892
Wyoming	2,951,156	71,001	2,880,155
	50,607,920	2,363,646	48,244,274

Coal lands classified and appraised during the fiscal year 1915, in acres.

State.	Total classification.		Reclassification.		Net increase or decrease (shown by minus sign) in outstanding classification.		Coal land appraised	
	Coal land with and without valuation.	Noncoal.	Coal land reclassified as coal.	Noncoal reclassified as coal.	Coal.	Noncoal.	Total coal land appraised.	Appraised coal land reclassified as noncoal.
California	.....	121	.....	.....	.....	121	.....	.....
Colorado	183,302	226,793	191,544	81,454	− 8,242	145,339	182,487	191,544
Montana	83,635	1,278,744	72,891	1,668	10,744	1,277,076	82,117	72,891
New Mexico	7,073	340,394	5,448	.....	1,625	340,394	7,073	5,448
North Dakota	319	40	.....	.....	319	40	319	.....
South Dakota	.....	10	10	.....	− 10	10	.....	10
Utah	1,980	291,606	2,138	80	− 158	291,606	1,980	2,138
Washington	86,867	175,573	.....	.....	86,867	175,573	640	.....
Wyoming	18,039	208,052	133,752	26,595	−115,713	181,457	[a] 18,079	133,752
	381,215	2,521,413	405,783	109,797	− 24,568	2,411,616	292,695	405,783

[a] Includes 40 acres previously classified but not appraised.

Net result of coal-land classification to June 30, 1915, in acres.

State.	Outstanding classification July 1, 1914.		Net result of classifications during fiscal year (decrease in area shown by minus sign).		Outstanding classification June 30, 1915.		
	Coal.	Noncoal.	Coal.	Noncoal.	Coal.	Noncoal.	Total.
Arizona		42,492				42,492	42,492
Arkansas	60,715	70,038			60,715	70,038	130,753
California	8,720	228,381		121	8,720	228,502	237,222
Colorado	3,373,389	9,101,579	− 8,242	145,339	[a] 3,365,147	9,246,918	12,612,065
Idaho	2,113	7,936,925			2,113	7,936,925	7,939,038
Montana	4,844,646	18,910,206	10,744	1,277,076	4,855,390	20,187,282	25,042,672
Nevada	5,880	2,428			5,880	2,428	8,308
New Mexico	976,419	3,232,564	1,625	340,394	978,044	3,572,958	4,551,002
North Dakota	2,099,324	2,911,631	319	40	2,099,643	2,911,671	5,011,314
Oregon	14,921	1,044,448			14,921	1,044,448	1,059,369
South Dakota	249,897	6,956,334	− 10	10	[a] 249,887	6,956,344	7,206,231
Utah	1,066,622	2,627,892	− 158	291,606	[a] 1,066,464	2,919,498	3,985,962
Washington	62,073	1,386,098	86,867	175,573	148,940	1,561,671	1,710,611
Wyoming	7,736,838	14,659,271	−115,713	181,457	[a] 7,621,125	14,840,728	22,461,853
	20,501,557	69,110,287	− 24,568	2,411,616	[a] 20,476,989	71,521,903	91,998,892

[a] Decrease in coal areas during fiscal year is due to reclassification as noncoal of land previously classified as coal land.

Valuation of coal lands June 30, 1915.

State.	Appraised coal land July 1, 1914.	Net result of appraisals during fiscal year (decrease in appraised areas during year shown by minus sign).	Total appraised land outstanding June 30, 1915.	Total valuation of appraised coal land.	Average value per acre.
	Acres.	*Acres.*	*Acres.*		
Arkansas	60,715		60,715	$1,473,762	$24.28
California	7,720		7,720	585,086	75.76
Colorado	2,871,920	− 9,057	[a] 2,862,863	186,110,238	65.00
Idaho	2,113		2,113	51,824	24.50
Montana	4,731,621	9,226	4,740,847	116,180,286	24.50
Nevada	5,880		5,880	117,600	20.00
New Mexico	958,467	1,625	960,092	21,252,657	22.10
North Dakota	2,099,324	319	2,099,643	34,065,935	16.23
Oregon	4,672		4,672	79,259	16.90
South Dakota	249,897	− 10	[a] 249,887	2,756,227	11.00
Utah	1,048,501	− 158	[a] 1,048,343	44,080,759	42.00
Washington	100	640	740	16,000	21.60
Wyoming	7,561,929	−115,672	[a] 7,446,256	385,344,887	51.70
	19,602,859	−113,088	[a] 19,489,771	792,114,520	40.66

[a] Decrease in coal areas during fiscal year is due to reclassification as noncoal of land previously classified as coal land.

Applications for classification and reclassification.—During the fiscal year the Survey received 18 applications for the classification of withdrawn lands either as coal or noncoal land and 10 applications for the revision of outstanding coal and noncoal classifications. Because three of these applications asked for noncoal classification in withdrawn areas regarding which the Survey has no detailed data, and because the evidence submitted by the applicants to show that the land is noncoal was of little value, these requests were not granted. On the other hand, most of the applications for classification as coal

land have related to lignite areas, and the applicants have been able to supply sufficient information to warrant the action requested. More than two-thirds of the applications for classification have been granted. The requests for reclassification as noncoal have related mainly to areas of flat-lying beds where, because no coal is exposed on or near the land, claimants have been unwilling to accept the coal classification. Five such applications have been made and denied.

OIL.

The classification of the public lands with reference to their prospective value for deposits of petroleum and natural gas was continued during the year in California and Wyoming.

In California more than 43,000 acres, principally in Kern County, but in part in San Luis Obispo County, were restored to entry, field examination by the Survey having shown these lands to be barren of oil. No withdrawals were made in California during the year. A recomputation of the acreage included in existing withdrawals was made, however, and it indicated that the area reported as outstanding on June 30, 1914 (see Thirty-fifth Annual Report, p. 135), was too small by more than 140,000 acres.

In Wyoming, as a result of geologic evidence obtained by detailed field examination, nearly 130,000 acres were restored in Natrona County and approximately 7,500 acres in Hot Springs County. In Natrona County more than 12,000 acres, and in the Bighorn Basin, in the north-central part of the State, approximately 183,000 acres, were withdrawn as a result of field work by the Survey. The lands withdrawn in the Bighorn Basin lie largely in Hot Springs County, but include also areas in Park County and a small area in Washakie County. There was a net increase during the period of a little less than 60,000 acres in the area withdrawn in Wyoming. The areas withdrawn in Arizona, Colorado, Louisiana, and Utah have not been either increased or decreased during the year.

The following table shows the areas withdrawn during the fiscal year and the total areas included in reserves at its close:

Oil lands withdrawn and restored during the fiscal year 1915, in acres.

State.	Outstanding July 1, 1914.	Withdrawals during fiscal year.	Restorations during fiscal year.	Outstanding June 30, 1915.
Arizona	230,400	.....	.....	230,433
California	1,550,848	(a)	43,301	a 1,507,547
Colorado	87,474	.....	.....	87,474
Louisiana	414,720	.....	.....	414,720
Utah	1,952,326	.....	.....	1,952,326
Wyoming	522,395	197,073	137,517	581,951
	4,758,163	197,073	180,818	4,774,418

a Recomputation of outstanding oil withdrawals in California shows that the areas previously reported should be increased by 140,404 acres.

Of especial interest during the year was the creation of Naval Petroleum Reserve No. 3. This reserve includes 9,481 acres in Natrona County, Wyo., and covers the Teapot dome immediately southwest of the Salt Creek field. This dome is as yet untouched by the drill. The lands included in the reserve were segregated from an outstanding withdrawal, so that its creation did not involve an increase in the acreage of lands withdrawn.

PHOSPHATE.

The classification of phosphate deposits in Florida, Idaho, Utah, and Wyoming was continued during the fiscal year without change in procedure. The regulations governing the withdrawal and restoration of phosphate lands have not been modified since they were adopted by the Survey on March 2, 1912.

Phosphate classification during the fiscal year was based on preliminary examinations in new areas and on detailed examinations in the withdrawn areas. These detailed examinations by the Geological Survey have resulted in material modifications of the outstanding reserves in Idaho and Wyoming. No phosphate examinations were made by the Survey in Florida, but field investigation by the General Land Office resulted in the withdrawal of a small area in that State. Of especial interest is new information, gathered during the year, showing the presence of phosphate on both the north and south sides of the Uinta Range in Utah. The reconnaissance field work in this region led to the withdrawal of additional lands, aggregating 224,558 acres, not previously known to contain phosphate beds.

The results of the phosphate examinations for the fiscal year, in so far as action toward classification has been taken, are set forth in the following summary:

Phosphate lands withdrawn and restored during the fiscal year 1915, in acres.

State.	Outstanding July 1, 1914.	Withdrawals during fiscal year.	Restorations during fiscal year.	Outstanding June 30, 1915.
Florida	120,377	120	280	120,217
Idaho	1,001,276	5,678	40,577	966,377
Montana	130,215	.....	.....	130,215
Utah	36,193	224,558	.....	260,751
Wyoming	1,553,988	42,865	414,037	1,182,816
	2,842,049	273,221	454,894	2,660,376

The year's activities resulted in a net reduction of 181,673 acres in the reserves outstanding at the beginning of the year, this figure representing the excess of the restorations over the withdrawals.

POTASH.

Field work by the Survey in search of potash was continued during the fiscal year. As in previous years, the work was largely exploratory. Experimental drilling in old lake basins is being followed by

sinking deep exploratory wells. The year's activities resulted in the withdrawal of 119,224 acres in the Smoke Creek Desert, in Nevada, and in the additional restoration of 2,880 acres of unsurveyed lands west of Searles Lake, in California, included in Potash Reserve No. 2, California No. 1, other lands in that reserve having been restored during the preceding fiscal year.

Potash lands withdrawn and restored during the fiscal year 1915, in acres.

State.	Outstanding July 1, 1914.	Withdrawals during fiscal year.	Restorations during fiscal year.	Outstanding June 30, 1915.
California	94,087	.....	2,880	91,207
Nevada	131,582	119,224	.....	250,806
	225,669	119,224	2,880	342,013

METALLIFEROUS LANDS.

The act of February 26, 1895 (28 Stat., 683), made provision for classifying, with respect to their mineral or nonmineral character, the lands within the Northern Pacific Railroad grant in certain land districts in Montana and Idaho, the work to be done by commissioners appointed for the purpose. The classifications made in many areas were unsatisfactory, and a reclassification was provided for in the sundry civil act of June 25, 1910 (36 Stat., 739). At the request of the General Land Office the work is being done by the Geological Survey. Field examination of these lands was first undertaken by the Survey during the field season of 1910. The work was continued during 1911, 1912, 1913, 1914, and 1915 and is nearing completion. The results of the Northern Pacific Railroad classification work for the five years are shown in the following table:

Lands in Northern Pacific Railroad grant in Idaho and Montana classified by the United States Geological Survey, by fiscal years, 1911–1915, in acres.

State.	1911	1912	1913	1914	1915	Total.
Idaho:						
Mineral	45,645	19,144	1,000	.....	.....	65,789
Nonmineral	90,712	53,055	1,200	.....	.....	144,967
	136,357	72,199	2,200	.....	.....	210,756
Montana:						
Mineral	130,386	1,134	19,800	480	6,629	158,429
Nonmineral	21,802	83,981	65,570	7,696	7,911	186,960
	152,188	85,115	85,370	8,176	14,540	345,389
Total:						
Mineral	176,031	20,278	20,800	480	6,629	224,218
Nonmineral	112,514	137,036	66,770	7,696	7,911	331,927
	288,545	157,314	87,570	8,176	14,540	556,145

In addition to the above work, examinations were made of the Colorado Indian Reservation in Arizona and California in 1914 for the Office of Indian Affairs, and classification of the reservation was reported to the Commissioner of Indian Affairs in March, 1915.

During the summer of 1914 an examination of the Snake River gravels in the Fort Hall Indian Reservation was completed by the Survey for the Office of Indian Affairs.

An examination of the Yuma Indian Reservation, in California, during the field season of 1914 resulted in the completion of the mineral classification for the Office of Indian Affairs, and the completed classification has been reported to that office.

During the summer of 1914 the Queniult Indian Reservation, Washington, was examined for the Office of Indian Affairs, and the lands therein were classified and reported on as to their value for all minerals except the oil and gas in a few sections.

Metalliferous classifications made during the fiscal year 1915, in acres.

State.	Mineral.	Non-mineral.	Total.
Arizona	31,934	214,048	245,982
California	5,360	78,338	83,698
Idaho	.....	447,940	447,940
Washington	.....	189,590	189,590
	37,294	929,916	967,210

HYDROGRAPHIC CLASSIFICATION.

WATER POWER.

Withdrawals and restorations.—The classification of the public lands with relation to their value in connection with water power was continued during the year, the withdrawals being made under the authority conferred by the two acts of June 25, 1910 (36 Stat., 847; 36 Stat., 858), and the act of August 24, 1912 (37 Stat., 497). On July 1, 1913, the area included in outstanding withdrawals was 1,898,405 acres. During the year 292,134 acres additional were withdrawn and 55,646 acres previously included in power-site reserves were restored to the public domain. On June 30, 1914, the total area withdrawn in connection with water power was 2,228,105 acres.

The following table shows the action taken during the year and the areas outstanding, classified by States:

Power sites withdrawn, restored to entry, and outstanding, fiscal year 1915, in acres.

State.	Outstanding July 1, 1914.	New withdrawals during fiscal year.	Restorations during fiscal year.	Outstanding June 30, 1915.
Alabama	120			120
Alaska		68,200		68,200
Arkansas	17,704			17,704
Arizona	190,431	147,000		337,431
California	222,769	33,201	280	555,690
Colorado	270,390			270,390
Idaho	272,759	5,082	24,868	252,973
Michigan		1,240		1,240
Minnesota	11,020			11,020
Montana	157,041	510	2,200	155,351
Nebraska	761			761
Nevada	19,087	7,224		26,311
New Mexico	13,577			13,577
Oregon	266,710	656	4,040	263,326
Utah	378,147	2,603	18,160	362,590
Washington	97,537	7,507	988	104,056
Wyoming	73,564	18,911	5,110	87,365
	1,991,617	292,134	55,646	2,228,105

Applications for reclassification.—At the beginning of the fiscal year 13 applications for the reclassification of lands included in power-site reserves were awaiting action and during the year 49 were received. Out of this total of 62 cases action was taken on 51, leaving 11 pending at the close of the year.

Right-of-way applications.—Departmental regulations of January 6, 1913, under the act of Congress approved March 4, 1911 (36 Stat., 1253, 1254), and of March 1, 1913, under the act of Congress approved February 15, 1901 (31 Stat., 790), charge the Geological Survey with important administrative duties in connection with applications for rights of way over the public lands for purposes relating to the development of water power. Such applications, when received in proper form at the General Land Office, are now forwarded to the Survey for consideration of such matters as relative priority of applications, incompatibility of works, relative beneficial utilization of resources, and the engineering and economic features involved in the applications and permits. If the approval of an application is found to be compatible with the public interest, a draft of agreement is prepared setting forth terms on which the use of the desired right of way is to be conditioned, and a report is made on the circumstances in the case. On June 29, 1915, the Attorney General held that the act of February 15, 1901, is applicable to the Territory of Alaska, the field for development of power under permit being thereby extended.

In addition to applications for rights of way for hydroelectric development a large number of applications for rights of way of other types are referred to the Geological Survey for consideration and report. These embrace applications for rights of way for railroads under the acts of March 3, 1875 (18 Stat., 482), and March 2, 1899 (30 Stat., 990), affecting public lands and Indian reservations, respec-

tively, on which report is made as to whether or not the construction of the railroad will interfere with power or irrigation development on streams in the vicinity of the right of way; applications for rights of way under the act of March 3, 1891 (26 Stat., 1095), for irrigation uses on which report is made as to interference with power development, the feasibility of the project, and other features; applications for rights of way across national forests for mining, milling, and municipal purposes under the act of February 1, 1905 (33 Stat., 628); and a variety of miscellaneous applications for domestic, municipal, mining, and railroad water supply. The number of each type received and the action taken thereon is indicated in the following table:

Applications for rights of way during the fiscal year 1915.

Classes.	Pending July 1, 1914.	Received during fiscal year.	Acted on during fiscal year.	Pending June 30, 1915.
Railroad: Acts of Congress approved Mar. 3, 1875 (18 Stat., 482), May 13, 1898 (30 Stat., 409), Mar. 2, 1899 (30 Stat., 404), etc.	30	118	119	29
Irrigation: Acts of Congress approved Mar. 3, 1891 (26 Stat., 1095), May 11, 1898 (30 Stat., 404), etc.	16	218	205	29
Power: Acts of Congress approved Feb. 15, 1901 (31 Stat., 790), Mar. 4, 1911 (36 Stat., 1253, 1254), etc.	53	31	45	39
Miscellaneous: Acts of Congress approved Jan. 21, 1895 (28 Stat., 635), May 11, 1898 (30 Stat., 404), May 21, 1898 (29 Stat., 127), Jan. 13, 1897 (29 Stat., 404), Feb. 15, 1901 (31 Stat., 790), Feb. 1, 1905 (33 Stat., 628), Mar. 4, 1911 (36 Stat., 1253, 1254), etc.	11	93	96	8
Total number of applications for original consideration	110	460	465	105
Additional applications for reconsideration	47	67	76	38

NOTE.—The first application received from the Secretary's office was dated Oct. 11, 1909; from the General Land Office Nov. 11, 1909; from the Office of Indian Affairs Dec. 23, 1909.

IRRIGATION.

Reservoir withdrawals.—A number of reservoir sites, valuable principally for the storage of water for irrigation, have been examined by the Geological Survey, and, on its recommendation, the lands they include have been withdrawn from entry. The area included in such withdrawals at the close of the fiscal year is shown in the following table:

Reservoir sites restored to entry during the fiscal year 1915, in acres.

State.	Outstanding July 1, 1914.	Restorations during fiscal year.	Outstanding June 30, 1915.
Arizona	33,040	.....	23,040
Montana	15,640	.....	15,640
North Dakota	1,569	.....	1,569
Oregon	10,619	.....	10,619
South Dakota	8,542	8,542	.....
Washington	35,943	.....	35,943
	95,353	8,542	86,811

Carey Act segregations.—During the year 7 proposed segregation lists under the Carey Act were received for report as to available water supply, general feasibility of plan of reclamation, and mineral character of the lands, and reports on 6 of these lists had been submitted before the fiscal year closed. Supplemental reports on 3 other lists were also furnished.

Irrigation projects.—The Geological Survey, by instructions of the Secretary of the Interior dated March 15, 1913, furnishes to the Commissioner of the General Land Office all information at hand relative to the available water supply and the feasibility of irrigation projects whose water rights or shares are presented as evidence of compliance with the requirements of the desert-land act. During the year 151 such cases were received and 119 were carried over from the preceding year. Of these 270 cases 162 were reported on and 90 were pending June 30, 1914. Supplemental reports were rendered on 18 cases.

ENLARGED HOMESTEADS.

Classification of lands under the enlarged-homestead acts of February 19, 1909 (35 Stat., 639), June 17, 1910 (36 Stat., 531), and June 13, 1912 (37 Stat., 132), was continued during the year. By the act of March 3, 1915 (38 Stat., 953), the enlarged-homestead act was extended to Kansas, and by the act of March 4, 1915 (38 Stat., 1163), to South Dakota, making the act now applicable to 14 States. Designations during the fiscal year have added a large area of land to that previously classified, the added land having been included as a result of investigations of surface and underground water. The following table summarizes the work of the year:

Enlarged-homestead designations during the fiscal year 1915, in acres.

State.	Outstanding July 1, 1914.	Designations during fiscal year.	Cancellations during fiscal year.	Outstanding June 30, 1915.
Arizona	24,530,036	501,981	.....	25,032,017
California	850,506	1,146,092	.....	1,996,598
Colorado	24,293,297	539,947	111,082	24,722,162
Idaho:				
Sections 1-5	7,193,220	1,289,074	27,189	8,455,105
Section 6	53,316	33,598	121	86,793
	7,246,536	1,322,672	27,310	8,541,898
Kansas	.....	277,605	.....	277,605
Montana	42,997,071	3,766,349	2,607	46,760,813
Nevada	46,303,933	1,264	.....	46,305,197
New Mexico	19,045,996	4,328,545	.....	23,374,541
North Dakota	8,379,764	360,057	314	8,739,507
Oregon	14,869,825	2,066,723	.....	16,936,548
South Dakota	.....	1,756,332	.....	1,756,332
Utah:				
Sections 1-5	6,966,309	181,244	160	7,147,393
Section 6	1,217,106	2,606	680	1,219,032
	8,183,415	183,850	840	8,366,425
Washington	3,660,853	384,688	28,654	4,016,887
Wyoming	17,920,496	849,154	.....	18,796,650
	218,281,728	17,485,259	170,807	235,596,180

The general provisions of the acts, which apply in all 14 States, permit the entry by one person of 320 acres of "nonmineral, nonirrigable, unreserved, and unappropriated surveyed public lands which do not contain merchantable timber." As a prerequisite to the allowance of such entry, the land must have been designated by the Secretary of the Interior as not being, in his opinion, "susceptible of successful irrigation at a reasonable cost from any known source of water supply." Under the provisions of section 6 of the acts of February 19, 1909, and June 17, 1910, applicable in Utah and Idaho, the Secretary may further designate lands which do not have upon them "such a sufficient supply of water suitable for domestic purposes as would make continuous residence upon the lands possible," and entrymen upon such lands are relieved of the necessity of residence. By the act of March 3, 1915 (38 Stat., 956), the enlarged homestead act was amended so as to permit, under certain conditions, an additional entry, though final proof has already been submitted on the original entry.

Designations under the enlarged-homestead act are made either in large, compact areas, as a result of field investigations covering rather large districts, or in small units, as a result of investigations made at the request of prospective entrymen. These requests are referred to as enlarged homestead petitions, and because of the fact that the larger areas of land to which the acts are believed to be applicable have already been designated, the record of the year shows a large increase in the number of petitions received. This has in part been the result of the extension of enlarged homesteads to two additional States and in part of the passage of the act of March 4, 1915 (38 Stat., 1163), which provides that a preference right to enter the lands designated can be secured by the filing of an application at the local land office of the district in which the lands are situated. The following table indicates the disposition made of petitions received during the year:

Action on petitions under the enlarged-homestead acts during the fiscal year 1915.

State.	Pending July 1, 1914.	Received during fiscal year.	Action taken.			Total acted on.	Pending June 30, 1915.	Cases reconsidered.
			All designated.	Part designated.	Refused.			
Arizona	8	51	37	2	7	46	13	3
California	66	333	210	0	27	237	162	10
Colorado	54	257	106	12	51	169	142	17
Idaho	481	826	473	45	397	915	392	122
Kansas	0	194	63	1	1	65	129	0
Montana	619	1,803	1,061	124	162	1,347	1,075	81
Nevada	0	12	3	0	0	3	9	0
New Mexico	42	293	174	35	38	247	88	22
North Dakota	67	111	131	7	17	155	23	40
Oregon	136	336	327	40	41	408	64	35
South Dakota	0	905	52	1	1	54	851	0
Utah	79	197	41	3	18	62	214	3
Washington	39	127	104	7	7	118	48	3
Wyoming	66	221	126	26	18	170	117	30
	1,657	5,666	2,908	303	785	3,996	3,327	372

A set of maps of the States affected, showing areas designated under the enlarged-homestead acts and the status of designations June 30, 1915, has been printed.

PUBLIC WATER RESERVES.

As information has become available recommendations have continued to be made for the creation of public water reserves, in order that important springs and sources of stock water on the desert and semiarid range lands may remain accessible to the public. Additions amounting to 19,257 acres have been made during the year to reserves of this type. The action taken is summarized in the following table:

Public water reserves withdrawn from entry and restored to entry during the fiscal year 1915, in acres.

State	Outstanding July 1, 1914.	Withdrawn during fiscal year.	Restored to entry during fiscal year.	Outstanding June 30, 1915.
Arizona	1,200	1,918	126	2,992
California	43,524	7,030	.....	50,554
Colorado	480	.....	.....	480
Idaho	.....	5,765	.....	5,765
Montana	.....	1,040	.....	1,040
Nevada	.....	1,464	.....	1,464
New Mexico	1,440	.....	.....	1,440
Oregon	2,500	.....	.....	2,500
Utah	32,707	1,520	240	33,987
Wyoming	81,911	520	.....	82,431
	163,762	19,257	366	182,653

PUBLICATION BRANCH.

DIVISION OF BOOK PUBLICATION.

SECTION OF TEXTS.

During the year 48,911 pages of manuscript were edited and prepared for printing and proof sheets for 21,407 final printed pages were read and corrected. This work involved the handling of 5,099 galley proofs and 35,522 page proofs. The corresponding figures for 1913–14 were 47,751 pages of manuscript, 16,786 final printed pages, 4,574 galley proofs, and 28,202 page proofs. Indexes were prepared for 66 publications, covering 16,723 pages; the figures for the previous year were 56 publications and 11,143 pages. The list given on pages 16–37 shows the number, scope, and character of the reports issued during the year.

At the close of the fiscal year eight persons were employed in this section. The water-resources branch has continued to render special assistance in copy preparing and proof reading.

SECTION OF ILLUSTRATIONS.

The number of illustrations prepared was 3,553, comprising 191 maps, 765 photographs prepared for reproduction, 905 diagrams and sections, 1,480 paleontologic drawings and photographs, and 212 miscellaneous. The processes used for the reproduction of the illustrations sent to the printer and the number reproduced by each process were as follows: Chromolithography and photolithography, 185 subjects; halftone engraving, 674 subjects; zinc etching, 553 subjects; wax engraving, 1 subject; cuts already engraved, 74 subjects. Proofs to the number of 2,000, including 380 revises, were received and compared critically. The finished work representing all the lithographs furnished by contractors was examined. Electrotypes of 99 cuts were furnished to outside applicants. At the close of the year material for illustrating 24 reports was in preparation.

As in previous years, a cost record has been maintained. The personnel of the section at the close of the year consists of the chief of the section, 9 draftsmen, 1 under clerk, and 1 messenger boy.

SECTION OF DISTRIBUTION.

The section of distribution received during the year 187 new books, 16 reprinted books, 3 new geologic folios, 17 geologic maps, 3 revised and reprinted geologic folios, 8 revised geologic maps, 4 reprints of geologic maps, 90 new topographic maps, 9 revised maps, 8 photolithographs, and 98 reprints of maps, a total of 443 publications. The total of all editions received was 689,192 books, 24,066 geologic folios, and 711,711 maps, a grand total of 1,424,969. This does not include pamphlets for administrative use, such as lists of publications and index maps.

There were distributed 596,649 books, 23,588 folios, and 487,049 maps, including 136 books, 16,583 folios, and 342,404 maps sold, a total of 1,107,286, an increase in books and maps and a decrease in folios, the demand originating from the low-priced sale of folios because of fire damage being largely satisfied last year.

The total amount received and turned into the Treasury as the result of sales of publications was $27,711.12. The sales of topographic and geologic maps amounted to $26,030.97, of topographic and geologic folios $1,400.15, and of books $280.

Sixteen persons were employed in this section during the year, and 84,788 letters were received and answered during that period.

DIVISION OF MAP EDITING.

SECTION OF GEOLOGIC MAPS.

This section continued in charge of George W. Stose, geologist, who directed the publication of the maps and illustrations of the geologic folios and critically reviewed all geologic maps intended for publication in other reports of the Survey.

Twenty-seven folios were handled in the section during the year. Six folios were completed and published during the year—Nos. 193 to 195, inclusive, and reprints of Nos. 112, 148, and 155, which were out of stock and were revised and brought up to date. The three new folios are noticed in the list of publications on page 458.

At the close of the fiscal year the maps and illustrations of folios 196 (Philipsburg, Mont.), 197 (Columbus, Ohio), and 198 (Castle Rock, Colo.) were complete and their texts were in proof, so that these three folios will be issued soon. The maps and structure sections of folios 199 (Silver City, N. Mex.), 200 (Galena-Elizabeth, Ill.), and 202 (Eureka Springs-Harrison, Ark.) were also printed, and the other illustrations of these folios were near completion. The maps and sections of the Colorado Springs (Colo.) folio were in press, the maps of the Leavenworth-Smithville (Mo.-Kans.) folio were in stone proof, and the maps of folio 201 (Minneapolis-St. Paul, Minn.) were engraved and in part in stone proof. The engraving of the maps for the Deming (N. Mex.), Detroit (Mich.), and Tolchester (Md.) folios was begun. The Colchester-Macomb (Ill.), Elkton-Wilmington (Md.-Del.), and Herman-Morris (Minn.) maps have been prepared for engraving, which will be begun as soon as the texts are completely criticized and revised. The Cleveland (Ohio), Pittsfield-Becket (Mass.), and Sheffield-Sandisfield (Mass.) maps have been partly prepared for engraving, but are awaiting slight field inspection. The Bellefonte (Pa.), Bessemer-Vandiver (Ala.), and Montevallo-Columbiana (Ala.) maps have been examined, but are awaiting field conference and office revision before preparation for engraving.

Two draftsmen, specially qualified to read and prepare geologic maps, sections, and other drawings, are employed in the section under the direction of the geologist in charge.

SECTION OF TOPOGRAPHIC MAPS.

At the beginning of the year 183 atlas sheets and maps of special areas were on hand for publication and the accessions during the year were 102, making a total of 285. Of these, 107 (90 new engraved maps, 9 engraved maps which are new editions or new in form of publication, and 8 photolithographs) were published. The following statement shows the comparative status of map editing and publication on June 30 for the last five years:

Progress of map publication for five years ended June 30, 1915.

	1911	1912	1913	1914	1915
Published during the year	86	114	101	102	107
In process of engraving	56	65	89	69	87
Unedited	95	102	105	114	91

The manuscripts edited during the year comprise 117 topographic atlas sheets and other maps prepared for engraving, 3 of which were afterward withdrawn from publication, 26 sheets of plans and profiles of 11 rivers, corrections for 128 engraved maps about to be reprinted, and 226 maps or sheets for the illustration of 33 Survey reports. The proof read comprises 98 new topographic maps, corrections to 57 old maps, 2 panoramic views, and 15 maps reproduced under contract. The index maps for 11 circulars of the series 9–323 were revised and reprinted during the year, and a text was adapted for each of 14 new State index circulars which have been published.

Six men were continuously employed in this work.

DIVISION OF ENGRAVING AND PRINTING.

MAPS AND FOLIOS.

During the fiscal year 90 topographic maps were engraved and printed; 9 topographic atlas sheets were corrected after field revision and new editions printed; and 7 State maps, scale 1:500,000, and 1 three-color topographic map were photolithographed and printed during the year, making the total number of new maps and new editions printed 107.

Corrections were engraved on the plates of 118 sheets, including 112 for reprinted editions and 6 for other purposes. Of those corrected for reprinting, including new maps (engraved and photolithographed), 206 different editions were printed and delivered to the map room. This is a decrease of 95 editions and 232.011 copies of regular office maps from the previous year.

Three new geologic folios and three reprinted folios were published during the year, the number published in the preceding year. Of the new folios one is a double folio and one (the San Francisco) contains five sets of geologic maps. State editions of two folios and octavo editions of two folios were issued during the year. Editions and partial editions of folios and octavos amounting to 24,066 copies were printed and delivered, a decrease of 4,164 copies during the year.

CONTRACT ENGRAVING AND PRINTING.

For the Government Printing Office the following items were printed and delivered: Illustrations for the annual report of the governor of Hawaii; annual report of the Commissioner General of Immigration; annual report of the Commissioner of Indian Affairs; annual report of the Chief of Engineers, United States Army; annual report of the governor of Alaska; annual report of the Board of Regents, Smithsonian Institution; annual reports of the War Department, volume 2 (War Document 480); Fiscal regulations, Department of Agriculture, 1915; Limnological study of the Finger

Lakes of New York, Bureau of Fisheries; American Ephemeris and Nautical Almanac, 1915; American Ephemeris and Nautical Almanac, 1918; Report on education of the natives of Alaska; Statistical Atlas of the United States, 1910; Department of Agriculture Bulletins 181, 198, and 204; Census reports, volumes 1–3, population, volume 5 (agriculture, general report and analysis); Department of Agriculture, Office of the Secretary, Report 100, Potash from kelp; Plane-table manual (Appendix 7, report of the Superintendent of the Coast and Geodetic Survey, 1905); United States Coast Pilot, part 4, Point Judith to New York; Inside Route Pilot, Key West to New Orleans; Inside Route Pilot, coast of New Jersey; Revenue-Cutter Service Bulletin 3, International ice observation and ice patrol in the north Atlantic Ocean; Bureau of Mines Bulletin 98, report of the Selby Smelter Commission; Interstate Commerce Commission reports, volume 24; House Document 971, Sixty-third Congress, second session—Red Lake Reservation; illustrations for Geological Survey Bulletins 527, 531–B, 575, 576, 578, 580–K, 580–M, 581–D, 582, 586, 589, 590, 592, 592–A, 596, 600, 602, 604, 606, Professional Papers 87, 90–I, 90–J, 95–B, Water-Supply Papers 306, 309, 319, 338, 342, 343, 344, 346, 347, 348, 349, 350, 366, 367, 368, 369, Mineral Resources, The stone industry in 1912, The stone industry in 1915, and Topographic instructions of the Geological Survey. In addition, the following separate illustrations were printed and delivered to the Government Printing Office: Diagrams of six bird reservations and one elk reservation; panoramic views of Yosemite, Yellowstone, Glacier, Mount Rainier, and Crater Lake national parks; maps showing glaciers of Glacier and Mount Rainier national parks; map showing origin of the scenic features of Glacier National Park; Photometric lamp-sheet test, Form 174; township blank, Form 4–675a; map of National Zoological Park; map of the United States by counties; map of the world (Department of Agriculture); map showing the areas quarantined for the gypsy moth and brown-tail moth, 1914 (Department of Agriculture); Protractor, Form 678 (Department of the Interior); sectional diagram (Department of the Interior); identification cards (Department of the Interior); sample markings for brass caps (Department of the Interior).

The following work was done for other Government departments and bureaus: For the Forest Service, maps of 17 national forests, 11 fire folders and tourists maps, 5 proclamation diagrams of national forests, 4 enlargements of field sheets, annual programs of work, 1914 and 1915, annual estimate blank, blank form (grazing classification), diagram, Form 493, homestead entry plats, lookout station protractor, map showing national forest areas, map of North America 7½ by 10 inches, map of North America 15 by 20 inches, North America outline map, map of southern Appalachian region, United

States contour map, section diagrams, and other miscellaneous work; for the General Land Office, 1,492 township plats, 677 mineral plats, 12 State maps showing homesteads, maps of two Indian reservations, 21 plats of villa sites, and other miscellaneous works; for the Office of Indian Affairs, maps of 4 Indian reservations; for the Panama Canal, 10 maps of Canal Zone and 1 map showing Isthmus and completed canal. Work was also done for the Reclamation Service, Alaska Boundary Survey, War Department (Corps of Engineers, United States Army), Interstate Commerce Commission, District of Columbia (public schools), War Department (Students' Military Instruction Camp), Panama-Pacific International Exposition, Bureau of Mines, Bureau of Standards, Bureau of Education, Weather Bureau, Public Health Service, Department of the Interior, Smithsonian Institution, Alaskan Engineering Commission, Bureau of Lighthouses, Department of Labor, Department of Agriculture (Bureau of Chemistry), War Department (Army Service Schools and Coast Artillery School), Department of Labor (Immigration Service), Navy Department (United States Marine Corps), Bureau of Labor Statistics, Hydrographic Office, Bureau of American Ethnology, National Museum, Post Office Department, Bureau of Soils, and United States and Canada Boundary Survey. In addition to the above, a large amount of miscellaneous work was done for other divisions and branches of the Survey. This work for various branches of the Government amounted to about $72,000, for which the division was reimbursed by transfer of credit on the books of the United States Treasury.

Work was also done for Houghton, Mifflin & Co., Heliotype Co. of Boston, Norris Peters Co., Geological Survey of New Jersey, J. M. Kennedy, Department of Chemical Engineering, University of Michigan, War Department (United States Engineers Office, Philadelphia, Pa.), and N. C. Grover, and the money received in payment for the work, amounting to about $350, was turned into the Treasury of the United States to be credited to miscellaneous receipts. Under cooperative agreements, transfer impressions were furnished without charge to the State surveys of Kentucky, Illinois, and Pennsylvania.

There was also a large amount of miscellaneous office work, including index circulars, list of geologic folios and topographic maps, State maps, etc. This work, for which no refund was obtained, amounted to about $4,500.

Of contract and miscellaneous printing of all kinds, the total number of copies delivered was 2,803,428, which required approximately 3,850,004 printings. The total number of copies printed, including topographic maps and geologic folios, was 3,533,726, requiring ap-

proximately 8,525,104 impressions. On requisition of the Government Printing Office, 333 transfer impressions were made and shipped by contracting printers.

PHOTOGRAPHIC LABORATORY.

The output of the photographic laboratory included 15,095 negatives, of which 2,378 were dry, 3,652 were wet, 664 were paper, 7,437 were field negatives developed, 964 were lantern slides, and 2,361 were photolithographic; 3,824 zinc plates, 278 zinc etchings, 248 celluloids, and 48,734 prints, of which 22,906 were maps and diagrams and 25,828 were photographs for illustrations. In addition 2,110 prints were mounted and 192 slides colored.

ADMINISTRATIVE BRANCH.

EXECUTIVE DIVISION.

The work in the executive division was of the usual scope except that the work of the stores section and the shipping and receiving clerk was transferred to the division of accounts.

Mails, files, and records.—During the year 138,791 pieces of mail, of which 2,443 were registered, were opened and referred. In addition, 90,395 letters were received direct by the other divisions, a total of 229,186 for the Survey.

Of the letters opened in this division, 24,037 contained a total of $28,521.80 remitted for Survey publications, a decrease of 1 per cent in number of letters, and $1,283.93 in amount, compared with the fiscal year 1914.

The recording, referring, filing, and mailing of correspondence required practically the entire services of seven clerks. The number of letters mailed through the division was 136,827, an increase of about 13 per cent over the preceding year. This number does not include the outgoing registered mail, which numbered 11,960 pieces, or 239,559 pieces of letter mail sent direct from the other divisions—a total of 388,346 for the Survey, an increase of 6 per cent over 1914.

Personnel.—The roll of Secretary's appointees numbered 909 at the close of the fiscal year, 18 more than at the close of the fiscal year 1914. The total number of changes in the personnel for the year was 586, which included 131 new appointments, 112 separations, 305 promotions, 2 reductions, and 36 miscellaneous changes.

During the year 15,037 days of annual leave and 2,771 days of sick leave were granted, being 66 per cent of the amount of annual leave and 12 per cent of the amount of sick leave which it is permissible to grant under the law; 5,288 days of leave without pay were also granted.

DIVISION OF ACCOUNTS.

During the year the handling of express and freight shipments and issuing of stationery supplies from stock was transferred from the executive division to the division of accounts. During the year 3,504 pieces of freight and express were handled, of which 970 were outgoing and 2,534 were incoming, and 6,338 requisitions were filled from stock in the stationery room.

A condensed statement covering the financial transactions during the fiscal year is given below, including disbursements up to September 30. The unexpended balances of that date largely represent outstanding obligations.

Amounts appropriated for and expended by the United States Geological Survey pertaining to the fiscal year ended June 30, 1915.

Title of appropriation.	Appropriation.	Repayments.	Available.	Disbursements.	Balance.
Salaries, office of Director	$35,340.00	.....	$35,340.00	$35,198.83	$141.17
Salaries, scientific assistants	29,900.00	.....	29,900.00	29,800.00	100.00
Skilled laborers, etc	20,000.00	.....	20,000.00	19,999.66	.34
Gaging streams, etc	150,000.00	$33,634.72	183,634.72	182,750.14	884.58
Chemical and physical researches	40,000.00	12.04	40,012.04	38,487.77	1,524.27
Preparation of illustrations	18,280.00	.....	18,280.00	18,200.41	79.59
Mineral resources of United States	75,000.00	43.33	75,043.33	74,792.50	250.83
Geologic maps of United States	110,000.00	73,325.61	183,325.61	160,959.53	22,366.08
Books for the library	2,000.00	.....	2,000.00	1,326.25	673.75
Topographic surveys	350,000.00	1,134.72	351,134.72	349,653.86	1,480.86
Geologic surveys	400,000.00	3,018.37	403,018.37	388,413.39	14,604.98
Mineral resources of Alaska	100,000.00	.77	100,000.77	94,586.45	5,414.32
Surveying national forests	75,000.00	3.57	75,003.57	73,866.19	1,137.38
	1,405,520.00	111,173.13	1,516,693.13	1,468,034.98	48,658.15

Classification of expenditures by the United States Geological Survey pertaining to the fiscal year ended June 30, 1915.

Appropriation.	Total.	Salaries and wages.	Transportation of persons.	Transportation of things.	Subsistence and support of persons.	Subsistence and care of animals.	Communication service.	Printing, engraving, lithographing, etc.	Furnishing heat, light, power, etc.	Special and miscellaneous service.	Materials.	Stationery, drafting, etc., supplies.
Salaries, office of the Director	$35,198.83	$35,198.83										
Salaries, scientific assistants	29,800.00	29,800.00										
Skilled laborers, etc	19,999.66	19,999.66										
Gaging streams, etc	182,750.14	135,892.45	$17,571.34	$1,136.39	$9,926.37	$507.48	$398.61	$1,857.22	$4.20	$1,692.89	$1,527.66	$1,902.33
Chemical and physical researches	38,487.77	25,659.12	1,380.07	1,570.77	802.75	27.29	95.61	8.52	371.13	171.71	1,237.91	697.07
Preparation of illustrations	18,200.41	16,973.17		1.49			19.49	972.47		1.78	3.27	189.92
Mineral resources United States	74,792.50	67,983.71	1,704.55	76.98	1,118.03	.33	627.07	689.08		291.40	1.31	953.12
Geologic maps	160,959.53	130,519.99	122.90	58.22	77.40		66.23	1,450.39	2,131.28	2,072.59	4,524.41	15,554.22
Books for the library	1,326.25			4.10			.95					
Topographic surveys	349,653.86	238,285.20	27,921.78	3,735.75	41,743.63	9,936.41	835.36	3,793.26		2,145.34	1,267.23	2,068.52
Geologic surveys	388,413.39	304,081.61	27,623.47	2,221.29	20,233.29	4,937.20	1,191.70	6,204.24	12.35	4,509.70	446.71	2,672.62
Mineral resources of Alaska	94,586.45	61,161.12	14,069.96	2,627.80	4,174.42	404.60	180.85	1,255.30		593.51	235.82	763.79
Surveying national forests	73,866.19	48,178.69	4,052.65	543.90	7,673.66	5,068.84	135.58	146.20		762.25	267.76	445.73
	1,468,034.98	1,113,733.55	94,446.72	11,976.69	85,749.55	20,882.15	4,051.45	16,376.68	2,518.96	12,241.17	9,512.08	25,247.32

Appropriation.	Fuel.	Mechanic's, engineer's, etc., supplies.	Cleaning and toilet supplies.	Wearing apparel.	Forage and other supplies for animals.	Provisions.	Ammunition and explosives.	Special and miscellaneous supplies.	Equipment (including live stock).	Structures (bench marks).	Rent.
Gaging streams, etc	$142.63	$381.14	$2.65	$35.50	$134.21	$172.73	$4.55	$97.92	$6,121.42	$332.00	$2,408.45
Chemical and physical researches	326.27	87.31	19.97	2.05	145.33	847.92		30.73	4,820.04		187.20
Preparation of illustrations									38.82		
Mineral resources United States		.72	10.80						978.10		357.30
Geologic maps	96.61	558.92	276.64			18.95	7.72		3,424.06		
Books for the library									1,321.20		
Topographic surveys	284.10	44.77	37.19	1.34	4,726.36	3,195.06		72.08	7,345.73	2,131.10	83.65
Geologic surveys	177.86	69.34	40.72	14.00	1,407.45	4,140.36	155.84	242.86	7,993.28		37.50
Mineral resources of Alaska	180.91	12.51	54.81	88.65	1,361.47	2,907.07	58.72	77.73	4,292.73		84.68
Surveying national forests	72.36	7.38	56.37	1.02	2,701.59	1,784.97		10.30	1,804.25	59.68	3.01
	1,278.74	1,162.09	499.15	142.56	10,476.41	13,067.06	226.83	531.62	38,229.63	2,522.78	3,161.79

LIBRARY.

The library has acquired during the year all the important new publications of geologic interest or bearing on the work of the Survey. The European exchanges were somewhat less numerous than usual on account of the war. Altogether 12,795 books, pamphlets, and periodicals and 1,218 maps were received.

The cataloguing included current accessions and also the final cataloguing of older sections of the collection, embracing the geological surveys of Finland, Greenland, India, Mysore Province, Netherlands, Prussia, Rumania, the Transvaal, and the Union of South Africa; 60 sets of periodicals; and monographs on chemistry and on general, dynamic, structural, historical, and economic geology. The library furnished 777 title entries to the Library of Congress for printing; 11,968 cards were added to the catalogue.

Recorded loans numbered 8,069 books and 272 maps, this number not including the books and maps used in the library by 9,022 readers. The classification scheme and the catalogue have served as guides for the librarians of a number of geologic libraries, who have visited the Survey library and studied its working methods.

During the last nine months of the year about 600 books from the Washington City Public Library have been deposited in this library for recreative and educational reading by members of the Survey. From this deposit 1,713 loans were made, of which about 12 per cent were books on biography, poetry, travel, and the social sciences.

The bibliography of North American geology for 1913 was published as Bulletin 584. The bibliography for 1914 has been completed and is passing through the press as Bulletin 617. Work has continued throughout the year on the bibliography and index comprising all the published literature of American geology.

Exchange copies of Survey publications have been distributed promptly both to domestic and foreign libraries, with the exception of those for libraries in the countries now at war. These have been necessarily withheld until the Smithsonian International Exchange shipments shall be resumed.

REPORT OF THE DIRECTOR OF THE BUREAU OF MINES.

NOTE.

Dr. Joseph A. Holmes, the first Director of the Bureau of Mines, through whose efforts chiefly the bureau was established and built up, died at Denver, Colo., on July 13, 1915, in his 56th year. Though failing health had compelled him to leave Washington in the summer of 1914, Dr. Holmes continued to direct the policy of the bureau, to exercise a general supervision of its investigations, and to work on plans for increasing its usefulness until a short time before he died. His illness and death can be attributed to his courage, his eagerness to lead, and his devotion to duty, which impelled him to risk his life and to overtax his strength in his efforts for the safety of the miners and the advancement of the mineral industries of this country.

As Dr. Holmes was personally known to thousands and many tributes have been and will be paid to his character and achievements, I will not attempt here to describe how strongly he labored for the public good, nor to express the respect and admiration that I felt for him; but in taking charge of the work of the Bureau of Mines I freely acknowledge the pleasure and the inspiration I have derived from being associated with him during the time that he was director. I sincerely thank all who have labored to upbuild the bureau and to advance its purpose, and I assure everyone that as director I shall constantly strive to make the bureau the great agency for the increase of safety and efficiency that Dr. Holmes wished it to be.

VAN. H. MANNING, *Director.*

REPORT OF THE DIRECTOR OF THE BUREAU OF MINES.

JOSEPH A. HOLMES, *Director.*

PURPOSE AND AIMS OF THE BUREAU OF MINES.

Safety and health for workers in the mineral industries and greater efficiency and the prevention of waste in preparing and utilizing mineral resources—these are the aims of the Bureau of Mines and the purpose of the work it is doing. Thus, the inquiries and investigations it conducts are fundamental and deal with problems that are of the highest national concern.

In the conduct of its investigations the bureau's efforts are directed solely toward the advancement of the public good. It labors without bias and without prejudice, and it must of necessity be a nonpartisan organization. It does not favor the mine operator as against the miner, nor the miner as against the operator, but it does strive continually to advance the welfare of all those who labor in the mineral industries, and its work is for the benefit of those industries and for the public.

In its efforts to bring about safer and more healthful conditions and to increase efficiency and lessen waste, the bureau seeks the cooperation of all interested persons, and it welcomes the assistance of workmen's organizations, of technical societies, and of State officials and State governments in the work for the development of State mining laws and of more effective mine rules and regulations.

Under the terms of its new organic act (see page 698) the bureau is empowered to conduct investigations and inquiries that cover many different phases of the mineral industry in this country. The inquiries and investigations conducted, the results achieved, and the significance of the results are set forth in succeeding pages.

ORIGIN, DEVELOPMENT, AND ACCOMPLISHMENTS OF THE BUREAU.

The work now being done by the Bureau of Mines had its beginning in the testing and analyzing of fuels, as authorized by Congress, at the Louisiana Purchase Exposition in St. Louis, Mo., in 1904, a work that was under the supervision of the United States Geological Survey.

FUEL-TESTING AND STRUCTURAL-MATERIALS INVESTIGATIONS.

The work at St. Louis, which in 1904 was in charge of E. W. Parker, J. A. Holmes, and M. R. Campbell, of the Geological Survey, early in 1905 was placed under the direction of J. A. Holmes,

as expert in charge. Analyses of coals from different fields, and steam, gas-producer, washing, coking, and briquetting tests of these coals were made; and after 1905, under appropriations made by Congress, the testing of structural materials such as cement, building stone, and clay products for buildings was undertaken. Early in 1907 all the fuel-testing equipment, except that for coking and washing tests, was moved to Jamestown Exposition buildings at Norfolk, Va., where steaming and briquetting tests of coals from the Appalachian fields, for use in the Navy, were made in 1907 and 1908. The coking and washing equipment was moved to Denver, Colo., where in 1907 and 1908 tests were conducted to determine the possibility of making high-grade metallurgical coke from western coals, especially those in Government lands. Fuel-testing laboratories were also temporarily maintained in Columbus, Ohio; Pittsburgh, Pa.; Norfolk, Va.; Denver, Colo.; and Washington, D. C., the last for analyzing coal purchased for the Government. The investigations at Denver were discontinued on June 30, 1909, because of lack of funds.

FORMATION OF THE TECHNOLOGIC BRANCH OF THE UNITED STATES GEOLOGICAL SURVEY.

By an order of the Secretary of the Interior, dated April 2, 1907, the two groups of investigations described above—testing fuels and testing structural materials—were made a new branch of the United States Geological Survey, designated the technologic branch, J. A. Holmes, chief technologist, being in charge.

AUTHORIZATION OF MINE-ACCIDENTS INVESTIGATIONS.

As a result of a series of disastrous coal-mine explosions in December, 1907, Congress in May, 1908, authorized an investigation as to the causes of mine explosions, with a view to increasing safety in mining.

ESTABLISHMENT OF PITTSBURGH EXPERIMENT STATION.

Authority to occupy a part of the buildings and grounds of the old arsenal at Pittsburgh, Pa., having been obtained from the Secretary of War, a station for testing mining explosives was opened there in November, 1908. The first list of "permissible" explosives, those approved for use in dusty and gaseous coal mines under certain prescribed conditions, was published in 1909.

Other causes of mine explosions, as mine gases, coal dust, miners' lamps, and electrical equipment, were investigated at this station, as were the merits of various types of mine-rescue apparatus.

After the close of the Jamestown Exposition the need of a temporary home for the fuels and structural-materials investigations was manifest, and several proposed sites were considered. Finally, in 1908, under the agreement with the Secretary of War, the equipment used in the fuel investigations at Norfolk, Va., was moved to the arsenal grounds in Pittsburgh, where tests of explosives were already in progress. The equipment used in the structural-materials investigations at St. Louis, Mo., was transferred in 1909. The large number

of coal mines within a radius of 150 miles of Pittsburgh and the great industries of the district made the location particularly suitable.

On July 1, 1910, the investigation of structural materials, which had been transferred to the Bureau of Mines by the act establishing the bureau, was transferred by Congress to the Bureau of Standards of the Department of Commerce and Labor.

EQUIPMENT OF MINE-RESCUE STATIONS AND CARS.

In order to facilitate investigations of mine explosions and to render prompt aid after a mine disaster, stations equipped with rescue apparatus were established in the various coal fields. The first was established at Urbana, Ill., in 1908, in cooperation with the State geological survey; the second at Knoxville, Tenn., in 1909; and the third at Seattle, Wash., in the same year. Also several railroad cars were purchased, equipped with apparatus, manned, and used as means of quickly giving aid after disasters and of instructing miners in first-aid and rescue methods. The bureau now has seven mine-rescue stations and eight mine-rescue cars equipped and ready to respond to a call for aid at a mine disaster.

ESTABLISHMENT OF BUREAU OF MINES.

The great importance of the mine-safety and fuel investigations undertaken by the Geological Survey, and the widespread demand for a separate bureau or department to pursue these and other mining inquiries, resulted in Congress passing an act, effective July 1, 1910 (36 Stat., 369), which established the Bureau of Mines. J. A. Holmes was appointed director of the new bureau by President Taft.

On February 25, 1913, a new organic act (37 Stat., 681) for the Bureau of Mines was approved. This act, which widened the scope and enlarged the purpose of the bureau, is printed in full on page 98.

It has not been possible for the Bureau of Mines to meet from the appropriations made by Congress the demands from the Government and the public at large for investigations that would increase safety in mines and efficiency in the production and use of mineral resources. Inadequate facilities, especially at the Pittsburgh station, have hampered its work, and the use of even those facilities available at Pittsburgh has been hampered by the need of returning the buildings to the War Department. As a result of representations made to Congress, certain Government grounds adjoining those used by the Bureau of Mines were transferred to the city in exchange for a tract of land near the Carnegie Institute of Technology and the University of Pittsburgh, on which buildings for the bureau are now being erected from an appropriation made at the last session of Congress.

CHIEF FEATURES OF THE WORK OF THE BUREAU SINCE JULY 1, 1910.

In the five years since its establishment, from July 1, 1910, to June 30, 1915, the bureau has given chief attention, under the wording of appropriations made by Congress, to investigating the causes and

methods of prevention of coal-mine explosions and to safeguarding the lives of coal miners. In addition, coals and other mineral fuels belonging to or for the use of the Government of the United States have been analyzed and tested with a view to increasing efficiency in their utilization. Also, within the past two years investigations have been undertaken looking to greater safety and the prevention of waste in the metal-mining and miscellaneous mineral industries, and general examinations of several oil and gas fields of the country have been made with a view to eliminating or greatly reducing the large waste of natural gas in those fields. Finally, during the past year a preliminary organization for the purpose of investigating some of the urgent metallurgical problems has been effected. In addition, various problems incidental to the investigations mentioned have been attacked.

STUDY OF COAL-MINE EXPLOSIONS.

As the most urgent work before the bureau at its establishment concerned investigation of the causes and the possible prevention of gas and dust explosions in coal mines, the bureau attacked this problem in different ways—by mine investigations, by chemical and physical tests in the laboratory, and by large-scale tests; also, it took up the study of such preventive measures as experience had suggested.

For conducting the necessary large-scale tests with inflammable gas and with coal dust, an experiment mine consisting of two drifts or entries, each now 1,300 feet long, with branch entries and rooms, was made in a tract of land underlain by the Pittsburgh coal at Bruceton, Pa., 12 miles south of Pittsburgh. This mine was equipped with suitable apparatus for recording the speed and the violence of explosions, and has been used to determine the explosibility of different coal dusts under different conditions, and to ascertain how mine explosions may be checked or prevented.

INVESTIGATION OF EXPLOSIVES USED IN COAL MINING.

As the use of improper explosives has caused many mine explosions, the bureau has examined and tested the explosives used in mining, especially coal mining, and has caused manufacturers to compound explosives that are less dangerous or are better adapted for doing certain work. Some attention has been given to explosives for use in metal mines, where the health and efficiency of miners may be seriously affected by powder fumes. Much needed investigations of metal-mine explosives have been held back by lack of funds.

INVESTIGATION OF USE OF ELECTRICITY IN MINING.

Another problem that has been studied intensively by field investigations, by laboratory tests, and by experiments is the danger attending the use of electricity in mines, especially the danger of dust or gas explosions in coal mines, and the possibility of safeguarding

the use of electricity so as to lessen the risk of workmen being injured by shock or burns.

INVESTIGATION OF MINE LIGHTING.

As many coal-mine explosions and many disastrous mine fires have been started by the lamps or candles used underground, the bureau has been making an investigation of safety lamps, both flame and electric, for coal miners, in the course of which it has made thousands of tests. An investigation of lights for use in metal mines has been started and should be carried out with equal thoroughness.

USE OF RESCUE AND FIRST-AID APPARATUS.

The relative merits of different types of apparatus for use by miners in rescue and first-aid work after mine disasters have been carefully investigated, and much work has been done toward the development of more efficient types. In order to demonstrate the use of such apparatus and to train miners in approved methods of rescue and first aid the bureau has established mine-rescue stations convenient to different mining regions, and has in operation eight mine-rescue cars and two mine-rescue trucks.

STUDY OF SAFETY AND HEALTH PROBLEMS IN METAL MINES.

Certain safety problems in metal mining have been examined in a general way in connection with similar coal-mine problems, and during the past year decided progress has been made in a study of the relation of tuberculosis among miners to silicious dust in mine air.

INQUIRIES AS TO WASTE OF METALS, ORES, AND MINERALS IN TREATMENT AND USE.

In efforts to lessen or prevent enormous losses of metal in the concentration of ores and in the making of alloys and to bring about new uses or to increase the utilization of different mineral substances, the bureau has conducted some general inquiries and a few detailed investigations in the fields of metal mining, metallurgy, and miscellaneous mineral technology, giving especial attention to the extraction of radium and the prevention of smelter-smoke damage.

PETROLEUM INVESTIGATIONS.

Investigations to ascertain the causes of enormous losses in the production of oil and natural gas have been started, and work to bring about the use of less wasteful methods in the recovery of oil and natural gas is in progress. Also methods of utilizing oil and gas to greater advantage either for fuel or for other purposes are being studied, and especial attention is being given the development of methods of obtaining a larger proportion of gasoline from petroleum and of producing valuable compounds, such as benzol and toluol, from it.

COMPILATION OF MINING LAWS AND REGULATIONS.

The bureau soon after its organization began the compilation of the mining laws and regulations of the United States, of the several States, and of foreign countries. The purpose of the bureau in this work was to emphasize the particular laws and regulations that have proved most effective in increasing health and safety in mining. The bureau has now issued several bulletins giving brief and intelligent abstracts of the decisions of the various courts of this country in cases involving National and State laws relating to the mineral industry, and during the year has published in a two-volume bulletin, a complete collection of all mining laws enacted by Congress with copious annotations showing the construction placed upon these laws by the Federal and State courts, and the Land Department.

SOME BENEFITS FROM THE WORK OF THE BUREAU.

The extremely high death rate among the workers in the mineral industries in the United States, and especially among coal miners, was seen to be the matter most urgently demanding investigation by the Bureau of Mines at the time of its establishment. Consequently the early activities of the bureau centered about investigations to determine the causes of explosions in coal mines and methods by which such explosions could be prevented or checked, and safer and more healthful conditions in the coal-mining industry developed. It follows that the most notable result of the bureau's efforts during the past five years has been the development of a general public interest in greater safety and better health conditions in mines and metallurgical plants, and the gaining of the cooperation and active aid of all possible agencies in the progress of this movement.

The Bureau of Mines makes no claim to having been the first agency to call attention to the high death rate among miners; nor does it claim it was the first to urge the need of safer methods. It has gladly welcomed the aid of all agencies that have sought to better conditions, and it freely concedes the credit that is due them for what they have done. The bureau does claim, however, that its work has served to stimulate a nation-wide movement for greater safety in all industries and that the value of this work has been great and can not be measured in dollars. In its efforts to increase safety and efficiency in the mining industries, a general plan of cooperation has been adopted by the Federal Government and the larger agencies working for the same end. This plan is as follows:

1. That the National Government conduct the necessary general inquiries and investigations in regard to the mining industries and disseminate, in such manner as may prove most effective, the information obtained and conclusions reached.

2. That each State enact needed legislation and make ample provision for the proper inspection of mining operations within its borders.

3. That the mine owners introduce improvements with a view to increasing safety and reducing waste of resources as rapidly as the practicability of such improvements is demonstrated.

4. That the miners and mine managers cooperate both in making and enforcing safety rules and regulations as rapidly as these are shown to be practicable.

That this plan of cooperation is working to the public good is shown by the results already obtained in the saving of miners entombed by explosions; in the alleviation of suffering and the saving of life among miners who have received first-aid treatment; in the enactment of State laws to increase safety, prevent accidents, and lessen waste; and in the tendency to demand more efficient inspection in mining and other industrial establishments.

DEVELOPMENT OF METHODS OF PREVENTING DUST EXPLOSIONS IN COAL MINES.

That coal dust raised into the air by concussion and ignited may cause mine explosions more widespread and terrible than those of fire damp, a fact doubted by many mining men, was established by the bureau through its investigations of mine explosions, through laboratory tests, and through large-scale experiments at its experimental mine. Dusts from hundreds of mines in different coal fields have been studied and their relative inflammability has been determined. The possibility of improper explosives, or the improper use of explosives, causing explosions has been investigated, as has the possibility of explosions starting from electric sparks, miners' lamps, or mine fires. In addition, suggested methods of rendering coal dust harmless have been tested at the experimental coal mine. Devices used in Europe have been improved and new and more effective devices have been designed. Through the use of these improved devices it is practically certain that coal-dust explosions can be limited to small areas and can be prevented from spreading through a mine even after they are well started.

INCREASED USE OF APPROVED EXPLOSIVES.

Nearly 25,700,000 pounds of permissible explosives, 19,600,000 pounds of which was used in the coal mines, was consumed in this country during the calendar year 1914, displacing more than an equal amount of relatively more dangerous black powder. These permissible explosives have quick short flames, much less liable to ignite gas or dust than the flames of black powder or dynamite. No great explosion disaster has been traced to the use of these explosives, and their introduction marks one of the greatest advances yet made in increasing safety in dusty or gaseous coal mines. Investigations of explosives for use in metal mines are needed, but little more than a beginning has been made because of lack of funds.

SAFEGUARDING THE USE OF ELECTRICITY IN MINES.

By calling attention to the possible dangers attending the use of electricity in mines the bureau has led manufacturers to devise safer types of apparatus, especially electrical switches and motors, that can be used in gaseous atmospheres without danger of causing explosions by sparks or flashes. Also, the bureau's activities have led to the manufacture of approved types of hand and cap lamps for miners, by which the work of mining is rendered safer. Several States have enacted stricter laws regarding electrical equipment in mines, these laws being based on recommendations made by the bureau.

Lack of men and funds has prevented the bureau from taking up certain electrical investigations that are needed. Such investigations should cover storage-battery locomotives, the ignition of coal dust in air by electric flashes, and electric signaling systems for mines.

RESCUE AND FIRST-AID METHODS DEVELOPED.

By demonstrating the use of rescue apparatus and by training miners in methods of recovery work after mine disasters and of administering first aid to those injured by accidents the Bureau of

Mines has aroused and strengthened the movement for increasing safety and preventing accidents in all industries. Since the beginning of this educational work by the Government 33,552 miners have been trained by the crews of the bureau's stations and cars. Moreover, as a direct result of this educational work, and through the efforts of men who had received training, 200 men have been rescued from mines after explosions or other disasters. Many mines have established first-aid and rescue corps, and interest in these methods is being stimulated by first-aid contests between teams representing different mining companies and by teams representing miners' organizations in different States.

Legislation enacted at the last session of Congress provides for the establishment of additional safety stations to be under the supervision of the Bureau of Mines. Through these stations, if necessary funds are provided for their operation, training can be given and facilities provided for the training of miners in districts where such training and facilities have long been requested. One of the great benefits of this rescue and safety work of the bureau is the promoting of good citizenship among miners through the demonstration of the Government's interest in their welfare.

MORE HEALTHFUL CONDITIONS IN METAL MINES AIDED.

Few of the metal-mining investigations begun by the bureau have been in progress long enough to show large results. In the Joplin district, Missouri, an investigation made in cooperation with the bureau of the Public Health Service has revealed an excessively high mortality from tuberculosis and the importance of siliceous dust in mine air as a causative agent. In consequence of the bureau's work active measures to abate dust and make conditions in and about the mines more healthful have been taken by State and local authorities, by mining companies, and by miners.

Studies in metal mines in other districts have shown the need of better ventilation and of taking further precautions to safeguard health.

STATISTICS OF ACCIDENTS IN THE MINERAL INDUSTRIES.

When the Bureau of Mines was established no accurate and comparable statistics of mine accidents were available for all the mining States. Many of the States had an inspection service, but as each State had a different system of classifying accidents the collected figures were not precisely comparable and could not be readily used as a basis for efforts to increase safety in mining.

Limited funds restricted the bureau's efforts to collect accident statistics, but through the hearty cooperation of State mine inspectors it was able to compile an annual statement of coal-mine fatalities and later, through the cooperation of mine and quarry owners, to publish statistics of metal-mine and quarry accidents. Still later the bureau compiled annual statements of the production and distribution of explosives by States, and finally it collected accident statistics for coke ovens, ore-dressing plants, and smelters.

Under a cooperative arrangement with all State coal-mine inspectors a monthly report of coal-mine fatalities, showing the number, cause, and distribution by States, is published shortly after the close of each month.

All of the coal-mine fatalities (over 50,000) reported by State mine inspectors since the beginning of inspection by each State have been tabulated by causes, calendar years, and States, the figures covering the mining of more than 89 per cent of all the coal produced in the United States since 1807. A bulletin containing these figures, which is soon to be published, will place for the first time all reported coal-mine fatalities on a calendar-year basis under a uniform classification.

DETERMINATION OF THE QUALITY OF DIFFERENT COALS.

Up to 1904, when the coal investigations ultimately assigned to the Bureau of Mines were undertaken, relatively little information was available regarding the character of the coals in the United States and their suitability for different purposes. As a result of the bureau's work there has been compiled a series of comparable analyses of the coals found in the different parts of this country, which are proving of great value to Government engineers and purchasing agents and to all large users of coal.

INSPECTION OF COAL PURCHASED FOR THE GOVERNMENT.

The importance of supervising more carefully the Government's coal purchases was early recognized, as coal was being purchased according to reputation and trade name rather than on the basis of its quality as measured by contained moisture, volatile matter, and ash, and by heating value and efficiency as demonstrated by utilization under the conditions to be met. Coal was purchased simply as coal, and no check was had on the character and quality supplied the consumer. Under the supervision of the Bureau of Mines uniform specifications have been developed. These prescribe in detail definite requirements for coal purchased by the Government. The plan of purchasing on the specification basis was first adopted by the Treasury Department in 1906, and this method of purchase has since been extended until the plan—variously modified in form but the same in principle—has been adopted by all the departments of the Government, and is applied to almost all contracts large enough to warrant sampling and analysis and heating-value tests. The value of the coal purchased annually by the Government under specifications prepared by the Bureau of Mines or under the advice of the bureau is now not less than $7,800,000.

The results of other fuel investigations published by the bureau have served as a basis for improving equipment used to heat public buildings and for the development of improved types of power-plant furnaces and boilers. Moreover, these investigations have stimulated the development of more efficient gas producers. Investigations of house-heating equipment are developing results that promise to lower the cost of heating private buildings the country over.

BY-PRODUCTS IN COKE MAKING.

The value of the by-products annually lost in this country through the coking of coal in beehive ovens amounts to more than $40,000,000.[a] The wastefulness of the beehive oven has long been known, but only

[a] The value becomes much larger if crude intermediate products (for making dyestuffs, etc.) be included in the estimate.

recently has the pressing need of recovering these by-products and of building up a by-product industry, including the manufacture of dyestuffs and other coal-tar derivatives, been made clearly evident. The bureau has called attention to the possibilities of the by-product industry and to the work necessary for its upbuilding.

SAFETY IN METALLURGICAL PLANTS.

Statistics of accidents in mills, cyanide plants, and smelters have been collected, some tentative general studies of health and safety conditions at metallurgical plants (including iron blast furnaces and steel works) have been made, and definite recommendations for the improvement of health and safety conditions have been prepared. The need of further investigations is shown by the accident figures collected by the bureau, which indicate that more than 7,000 are injured annually in ore-dressing and smelting plants alone. A much larger but as yet undetermined number of persons are injured in the iron and steel plants of the country.

DECREASE OF WASTE AND INCREASE OF EFFICIENCY IN MINERAL TECHNOLOGY.

Some three years ago the problems of miscellaneous mineral technology, which includes the preparation and use of the minor metals, rare metals, and various minerals used in the arts, were assigned to the division of mineral technology, and Dr. C. L. Parsons was placed in charge.

As the field of work was first surveyed in a general manner and as the force assigned to the work was small, especially important problems were selected for investigation.

DETERMINATION OF MINERAL WASTES.

It was early apparent that one of the ways in which the Bureau of Mines could be most useful to the general mineral industries of the country was to study the possibility of eliminating some of the great wastes that take place in the commercial production of mineral products, and, incidentally, to assist wherever possible in increasing the efficiency of manufacturing processes and the utilization of domestic rather than imported material. The general subject of mineral waste was discussed in a bulletin, which brought out clearly the extent and variety of the losses throughout the country.

INCREASED EFFICIENCY IN PRODUCING KAOLIN AND FELDSPAR.

A comprehensive study was also undertaken of the feldspar, mica, and kaolin resources of the Appalachian region. The results of this study have been published and widely distributed to the pottery industry. All of the feldspar quarries in the Appalachian region were investigated and the quality of the spar was pointed out, to the effect that no better material for the pottery industry can be obtained anywhere. This has also been shown to be true of many of the kaolin deposits of the southern Appalachian region, some of which are remarkably white and equal in quality to any imported.

In connection with this work a new method has been developed for treating the secondary kaolins of the southern part of the Atlantic coastal plain, so that it seems probable that these kaolins, which occur in immense quantities, may be made available for white ware and be so much improved as paper filler that they will bring a much higher price.

It was shown that there were large quantities of ocher, mica, and some kaolinized feldspar now wasted in the South which might easily be saved with profit and utilized in our industries.

A study of the fuller's earth industry of the country was made through visits to the chief deposits mined for bleaching both mineral and vegetable oils, and the results were published in a bulletin. The great difficulty in the utilization of American earth was found and pointed out, and there can be no question that this work by the bureau has been largely instrumental in bringing about the great increase in the production and utilization of domestic earth during the past few years.

POSSIBLE SAVING OF METALS IN ALLOY MANUFACTURE.

In cooperation with the American Institute of Metals and the chemical department of Cornell University, the Bureau of Mines undertook a study of brass and nonferrous alloy manufacture, with especial reference to determining the relative efficiency of different types of furnaces in preventing the known large wastes of metal in both dross and fume. A bulletin published on this subject in 1914 has become an almost universally used handbook among the brass founders and is resulting in greater efficiency and in the prevention of metal losses. The bulletin pointed out that metal losses amounting to at least $2,000,000 a year might easily be prevented, and it is known to the bureau that many brass founders have changed their methods and have applied the remedies pointed out by the bureau.

RESULTS OF RADIUM INVESTIGATIONS.

Probably, however, the most striking of the mineral-technology investigations has been that dealing with radium. In 1912 the bureau showed that large quantities of ore were being mined in Colorado and shipped abroad for the production of radium, some of which was sold back to this country at a price far in excess of any just proportion of that received by the American miner for his raw material.

Through the cooperation of the National Radium Institute 1,000 tons of ore are being mined in the Paradox Valley of Colorado and a plant was built at Denver for producing radium. This plant has now been in successful operation for several months, and nearly 4 grams of radium has been extracted, which will be used in the treatment of cancer and malignant tumors. The bureau's work has shown that the price formerly paid the miners for the carnotite ore was entirely out of proportion to the value of the mineral contained, and that the cost of producing radium by methods developed by the bureau is so low that from Government-owned ore, at least, radium can be supplied to the hospitals of the Army, Navy, and Public

Health Service at a cost not exceeding $36,500 per gram, or one-third of prices that had been obtained by foreign producers.

One of the most important features of the radium investigations has been the development of methods whereby the large wastes of low-grade carnotite ore heretofore common may be prevented and the main part of the valuable minerals they carry may be readily shipped to market and utilized as a source of radium. This result will add greatly to the radium resources of the country, for heretofore probably 5 tons of low-grade ore has been mined and wasted for each ton of marketable ore shipped.

Incident to this work several new methods for the determination of radium and the extraction of uranium and vanadium from radium ores have been developed. Application has been made for patents, which, if granted, will be dedicated to the public.

LESSENING WASTE OF PETROLEUM AND NATURAL GAS.

Preliminary investigations to determine the losses of petroleum and natural gas that take place under existing methods of exploiting oil and gas fields were undertaken by the Bureau of Mines as soon as funds were made available. These investigations showed that the losses were enormous, amounting to ten millions of dollars a year in a single State. They also showed that the total annual loss in the petroleum industry throughout the country was not less than fifty millions of dollars, a large part of which was preventable.

In order to lessen this waste the bureau actively cooperated with State officials and private organizations in efforts to bring about the enactment of laws that would lead to the adoption of less wasteful practices. It investigated well-drilling methods and published and distributed descriptions of approved methods of drilling wells that encounter gas under high pressure and of extinguishing burning oil or gas wells. It also devised and demonstrated a practical process for drilling through porous formations by which waste of gas in sands overlying oil sands can be stopped and the invasion and ruin of many gas and oil sands by water can be prevented. By the use of this process in a single State it is estimated that a saving of natural gas worth fifteen millions of dollars was effected in less than 18 months.

As larger but still inadequate appropriations have been made by Congress the petroleum investigations have been extended to include other special problems connected with the increase of safety and efficiency and the prevention of waste. Particular attention has been given to problems that concerned the saving of oil or gas in fields within Government lands in California and to questions involved in the inspection of oil and gas lands belonging to the Indian tribes, especially those in Oklahoma.

Under a cooperative arrangement with the Bureau of Indian Affairs all technical details of methods of drilling wells and of transporting petroleum in lands belonging to the Indian tribes are subject to the scrutiny of the Director of the Bureau of Mines; and all details of production, such as the gaging of oil and gas wells and the collection of royalties, are under the supervision of the Commissioner of Indian Affairs.

RITTMAN PROCESSES.

Two processes devised by a chemical engineer of the bureau, W. F. Rittman, are of great importance. One of these processes will enable refiners to increase the output of gasoline from crude petroleum some 200 per cent or even more, and as the patent right for the process is to be dedicated to the public monopolization of the gasoline industry by means of private control of an efficient "cracking" process will be prevented. Also the price of gasoline as compared with that of crude oil will be reduced.

The other process is for the manufacture of benzol and toluol, used in the manufacture of synthetic dyes and high explosives, from heavy liquid hydrocarbons. Heretofore benzol and toluol have been obtained chiefly from coal and water gas tars. The Rittman process was developed from a laboratory scale to a commercial scale in cooperation with the Aetna Explosives Co., of New York, with which the Bureau of Mines, in March, 1915, entered into a cooperative agreement to develop the process. Experimental work was to be carried on until the commercial practicability of the process was demonstrated, when the contract with the Aetna Explosives Co. was to be canceled[a] and a license issued the company for the use of the process in making benzol and toluol.

Permits to use this process will be issued to any responsible party or parties who will agree to the terms exacted of the Aetna Company, namely, that all patentable processes and ideas developed in experimental work on the process shall be turned over to the department for the free use of the public.

BENEFITS FROM METALLURGICAL INVESTIGATIONS.

No comprehensive investigations bearing on safety, health, and efficiency in the metallurgical industries of this country have been conducted by the Bureau of Mines, and they can not be undertaken until necessary funds are provided. Up to the past year the metallurgical work of the bureau has been confined almost entirely to investigations of the smelter-smoke problem, preliminary inquiries as to the treatment of low-grade and complex ores, and some tentative studies of accidents and accident prevention at blast furnaces and steelworks.

PREVENTION OF DAMAGE BY SMELTER SMOKE.

In attacking the smelter-smoke problem the bureau cooperated with the Selby and the Anaconda smelter commissions. These commissions, composed of disinterested experts, were empowered to investigate and report on the complaints of fume damage by the Selby smelter in Solano County, Cal., and the Anaconda plant in Deer Lodge County, Mont. The Selby commission has made its report, which is soon to be published by the Bureau of Mines. The Anaconda commission is continuing its investigations. Each commission has been entirely independent of the Bureau of Mines, but the director of the bureau has served as a member of each commission, and the bureau has cooperated with the commissions by assisting

[a] The contract was canceled Aug. 24, 1915.

the broader aspects of their investigations, in an effort to make the results available for a general study of the scientific and technical problems involved.

The work of the Selby commission has attracted much attention, and the methods or procedure of the commission are being followed in other metallurgical-smoke investigations in different parts of the country.

The Bureau of Mines is giving especial attention to processes for removing sulphur from smelter gases, and has made decided progress in the study of the chemical reactions on which these processes are based.

OTHER RESULTS OF INVESTIGATIONS.

Investigations of methods of treating the low-grade and complex ores of Utah and adjacent States, which were begun in 1913, are showing what new methods are needed or what changes should be made in old methods in order to treat millions of tons of ore that now lie unworked because efficient and economical processes of saving the contained metals have not been perfected.

The study of accident prevention at blast furnaces and steel plants has already shown what are the common hazards and how they may be avoided.

During the past year a cooperative metallurgical exhibit was organized at the Panama-Pacific Exposition in collaboration with a number of large smelting companies and allied interests. This exhibit, which included a number of metallurgical testing laboratories, made possible a temporary, at least, enlargement of the smelter-fume work and the beginning of new investigations, especially one dealing with the leaching of gold and silver ores with cyanide solutions.

BRIEF SUMMARY OF THE MORE IMPORTANT WORK DURING THE PAST FISCAL YEAR.

Several of the year's accomplishments were especially important, in particular those concerning smelter smoke, the production of radium, the manufacture of gasoline, benzol, and toluol from petroleum, and the improvement of health and safety conditions in mines.

A process devised by one of the bureau's chemists, Dr. Rittman, and now in commercial operation, assures larger yields and cheaper production of gasoline from petroleum.

Another process devised by Dr. Rittman, which has been tested on a commercial scale, assures the production of benzol and toluol, used in making dyestuffs and high explosives, from petroleum, and should make this country independent of foreign sources of supply.

With the cooperation of the National Radium Institute radium has been produced in commercial quantities at a cost one-third of that by methods previously used.

An excessively high death rate from tuberculosis among the miners of the Joplin district, Missouri, was shown to be related to rock dust in the air of the mines, with the result that energetic measures to improve conditions are being taken by local and State officials.

Decided progress was made in the investigation of methods of preventing damage to vegetation from smelter smoke.

Continued investigation of the smelter-smoke problem has shown how some of the injurious constituents of metallurgical smoke may be removed without excessive expense and is aiding the development of practicable methods of removal.

The study of coal-mine explosions and of methods of preventing and limiting them was continued and another rock-dust device for stopping explosions was devised.

The inflammable gases in mine air were studied and methods of rendering them less dangerous were tested.

A rescue crew of the bureau aided the State mine inspector of West Virginia and local rescue crews in rescuing 42 men after an explosion at the Layland mine, West Virginia.

Oxygen breathing apparatus for the use of rescue parties was greatly improved, and a new type devised that is safer and more efficient than types in use.

Greater impetus was given the movement for first-aid and rescue training at metal mines.

Public mine-rescue and first-aid contests were held in cooperation with mining companies and organizations of miners.

Different types of safety and rescue apparatus were demonstrated before thousands of miners.

More than 2,400 miners were trained in rescue methods and more than 6,100 in first aid. On June 30, 1915, the total number of miners trained by the bureau since its organization was 33,552.

More than 100 miners were recovered or brought to safety through the efforts of miners, mine officials, State mine inspectors, and rescue crews of the Bureau of Mines, of operating companies, and of the State of Illinois.

Comprehensive rules for preventing accidents in or about metal mines were finally revised for publication.

Quarry accidents were investigated and recommendations for preventing them were made.

Accidents at blast furnaces were studied and rules for preventing them were suggested.

Methods of increasing safety and preventing accidents at steel plants were investigated and recommendations were made.

Various types of more efficient and less dangerous explosives for metal mines were investigated. The merits of permissible explosives were demonstrated in various coal-mining districts.

An explosion-proof motor for use in gaseous mines was approved.

Methods of safeguarding the use of electricity in and about mines were improved.

Safety recommendations were made in regard to the prevention of accidents in tunnels being driven under bodies of water.

Ventilation in metal mines and coal mines was studied and improvements were recommended.

Methods of limiting or preventing damage from subsidence of the surface caused by mining operations were studied.

Improvements were made in safety lamps as a result of the bureau's investigations.

Electric lamps for miners were greatly improved through the bureau's recommendations.

A method was devised for preventing much loss of valuable marble through cracking caused by earth pressure at certain quarries.

Sampling and assay methods were studied with a view to developing methods satisfactory to both producers and buyers of ore.

Carnotite ores in Colorado and Utah will be made valuable through concentrating methods devised by the bureau.

Methods devised for treating tungsten and molybdenum ores will enable mines now idle to be worked at a profit.

The purchase of fuels for the Government under specifications prepared by the Bureau of Mines continued to show substantial savings.

Investigations of kaolin and feldspar mining in different States showed how material equal to the best foreign grades could be profitably recovered.

An investigation of gas-producer practice in Europe showed how difficulties in the use of low-grade fuels can be overcome.

Peat and lignite investigations showed how these fuels can be utilized to advantage in regions where higher grade fuels are costly.

Tests to determine the fusibility of coal ash and its relation to clinkering in furnaces gave important results.

Studies of the origin and constitution of coal are giving information of value in ascertaining the most efficient methods of utilization.

Complex low-grade gold, lead, silver, and zinc ores were studied and information obtained that will aid in making available millions of tons of ore that can not be profitably treated by methods already used.

An investigation of the mining and milling of lead and zinc ores is showing how great losses in the concentration of these ores can be lessened or prevented.

Tests were made of the flotation processes to determine the possibility of reducing, through their use, losses of metal in present methods of concentrating lead and zinc ores.

Hazards in handling gasoline were studied, and safe practices were recommended.

The quantity of gasoline necessary to cause explosions of gasoline vapor in sewers and in tunnels was determined.

A simple and reliable device for indicating the presence of inflammable gas in mine air was designed.

The properties of natural gas and the dangers attending its use were studied.

A bulletin of 2,000 pages, entitled "United States Mining Statutes Annotated," which contains all the laws enacted by Congress that relate to the mining industry, with abstracts of all decisions construing these statutes, was published.

An investigation of placer-mining methods was undertaken.

Gold dredges were inspected to ascertain how losses of gold with present methods and equipment may be reduced.

Progress was made in the study of methods of reducing metal losses in melting nonferrous alloys.

Systematic investigations of waste and loss of petroleum and natural gas, especially on lands under the control of the Government, were begun.

Methods of drilling oil and gas wells so as to prevent present wastes were demonstrated in Oklahoma and other States.

Individual producers and organizations of producers cooperated with the bureau in efforts to lessen waste of oil and gas.

As a result of the bureau's efforts great waste of natural gas has been stopped.

Investigations were begun to determine how the cyanide process can be used more efficiently in leaching silver ores.

The smelting of titaniferous iron ores, with the object of making available as sources of iron great ore deposits now unworked, was studied.

SOME URGENT NEEDS OF THE BUREAU.

NEED OF MINE-EXPERIMENT AND MINE-SAFETY STATIONS.

At no time since the bureau was established has it been provided with the funds and facilities necessary to meet the many legitimate demands made on it for investigations looking to greater safety or increased efficiency in the mineral industries. Not only have the number and urgency of these demands increased more rapidly than the ability to meet them, but the lack of necessary funds and equipment has at times embarrassed the bureau in its efforts to save the lives of miners.

On March 3, 1915, in response to widespread demands, Congress passed an act (40 Stat., 959) directing the Secretary of the Interior to establish and maintain in the important mining regions of the United States and the Territory of Alaska, under the Bureau of Mines and in accordance with the provisions of its organic act, 10 mining-experiment stations and 7 mine-safety stations, movable or stationary, in addition to those already established. The act states that the province and duty of these stations shall be to make investigations and disseminate information with a view to improving conditions in the mining, quarrying, metallurgical, and other mineral industries, safeguarding life among employees, preventing unnecessary waste of resources, and otherwise contributing to the advancement of these industries; provides that not more than three of the mining-experiment stations and not more than three of the mine-safety stations shall be established in any one fiscal year, and authorizes the Secretary of the Interior to accept lands, buildings, or other contributions from the several States offering to cooperate in carrying out the purposes of the act.

Under the law three mining-experiment stations can and should be established during the current year—each in an important mining center, where investigations under Government supervision will increase the yield of metals now being mined or will result in the mining of deposits now unworked.

It is proposed that the mine-experiment stations shall investigate such problems as particularly concern the development and utilization of the mineral wealth of the regions in which they are situated, and it is expected that each State in which a station is situated, by supplementing the appropriations made by Congress, will cooperate in the study of mining problems by giving attention to problems that are local or especially concern that State. The act establishing these stations directs that they shall be maintained under the Bureau of Mines in accordance with the provisions of its organic act. This provision enables the director of the bureau to prevent duplication of work at different stations and to coordinate all investigations to the best advantage.

Some of the problems that will receive special attention at these stations are improvement of metal-mining methods to insure larger recovery of ore and greater safety; investigations of milling methods and metallurgical processes for the treatment of those ores in the recovery of which by existing methods there are losses that annually amount to millions of dollars, and investigations of methods or processes whereby mineral deposits now unworked can be made sources of national wealth.

In addition, it is proposed to purchase and equip under the terms of the act three mine-rescue cars, each to have headquarters in a region where facilities are now lacking for rendering prompt and effective aid at times of mine disasters or for beginning and continuing first-aid and rescue training such as has reduced loss of property, lessened the sufferings and period of disability of victims of accidents, and saved men entombed by mine disasters.

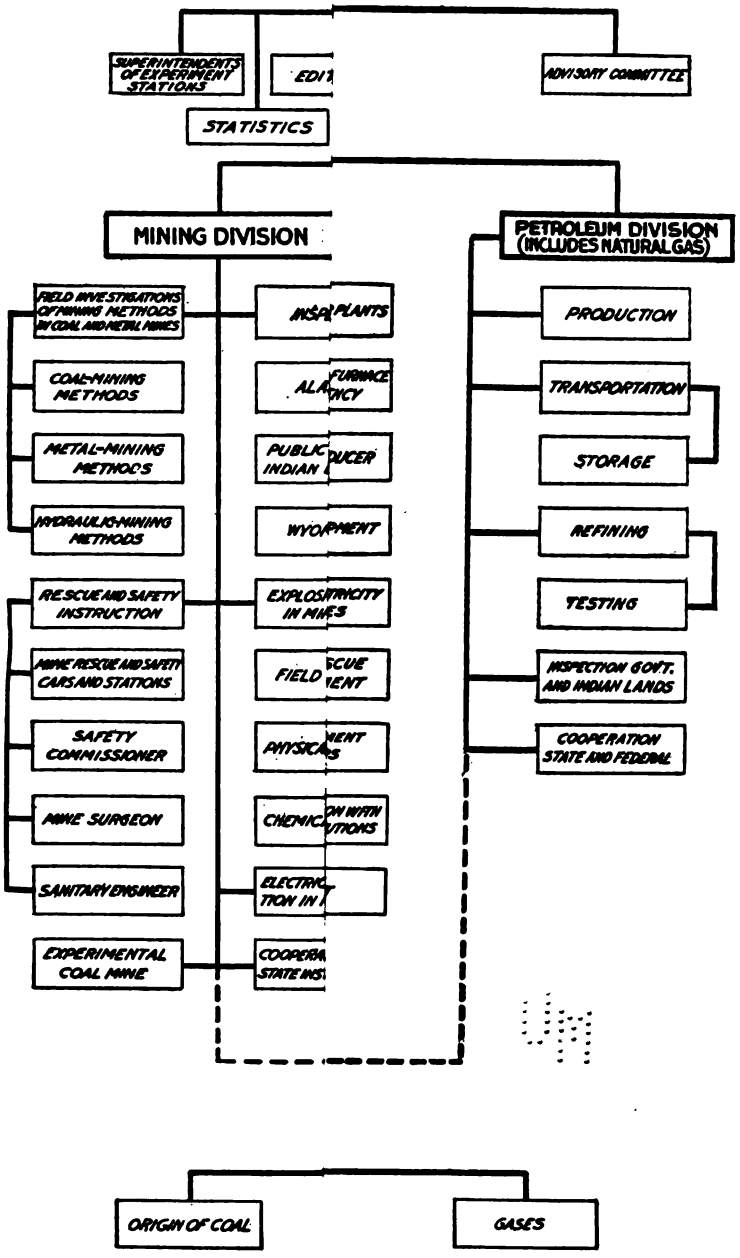
The mine-rescue cars now in use are old Pullman cars that have been converted to the use of the bureau. These cars need extensive repairs to enable them to comply with the safety requirements of railroads. The greatest practicable speed is demanded when rescue crews are being carried to the aid of entombed miners, and each rescue car must be strong enough to withstand the unusual strain. Hence there is need of substituting modern steel-constructed cars for the old wooden cars as rapidly as appropriations will permit.

NEED OF INVESTIGATIONS OF PETROLEUM AND NATURAL GAS.

Millions of cubic feet of natural gas and millions of gallons of oil have been wasted in a day in the careless and reckless exploitation of gas and oil fields. It is now recognized that the extent of the productive districts in the United States has been fairly defined, and that with the constantly increasing demand for these unrivaled fuels the production in the United States must be properly conserved. It is of the highest importance that the Nation's interests in the remaining supplies be protected and that waste in production and utilization be eliminated.

Many of the States have already recognized the need of preventing wastes and have enacted laws for the purpose. Much of this legislation has proved ineffective because it did not have the confidence of operators and because its enforcement was difficult. The Bureau of Mines, representing the public interest in natural resources, is in a position to bring together producers and marketers of petroleum and natural gas so that their cooperation may be assured and measures to lessen waste may be made effective. Recently various State committees in Oklahoma, Ohio, Illinois, and Indiana that have been considering legislation relating to oil and gas have called on the bureau for assistance, and have gratefully acknowledged the aid received.

Under such allotments as could be made from the appropriations up to the beginning of last year, the bureau could do little more than undertake a few general inquiries and study a few special problems in some fields. Last year it was able to begin a comprehensive study of many features of the problem of waste prevention and was able to cooperate more effectually with other Government bureaus and with various State organizations, especially in Oklahoma.


SUPERINTENDENTS OF EXPERIMENT STATIONS
EDI
ADVISORY COMMITTEE
STATISTICS
MINING DIVISION
PETROLEUM DIVISION (INCLUDES NATURAL GAS)
FIELD INVESTIGATIONS OF MINING METHODS IN COAL AND METAL MINES
COAL-MINING METHODS
METAL-MINING METHODS
HYDRAULIC-MINING METHODS
RESCUE AND SAFETY INSTRUCTION
MINE RESCUE AND SAFETY CARS AND STATIONS
SAFETY COMMISSIONER
MINE SURGEON
SANITARY ENGINEER
EXPERIMENTAL COAL MINE
PLANTS
PUBLIC
INDIAN
WYO
EXPLOS
IN MINES
FIELD
PRODUCTION
TRANSPORTATION
STORAGE
REFINING
TESTING
INSPECTION GOVT. AND INDIAN LANDS
COOPERATION STATE AND FEDERAL
ORIGIN OF COAL
GASES

industry. Recently the bureau completed an investigation of the petroleum industry in California, in which it had the valuable cooperation of the largest marketing, producing, and consuming companies of the State. The total production, consumption, and stocks, amount of crude oil used as fuel, amount refined, losses in transportation, and the disposition of petroleum products by States and foreign countries were investigated.

It is proposed to conduct similar investigations in all other productive fields to the end that the petroleum industry and the consuming public may have the benefit of authoritative and impartial information prepared under Government supervision. In collecting this information and in conducting its work for greater efficiency in the prevention of waste in the oil and gas fields the bureau employs competent engineers who will keep in touch with the progress and improvements in the various branches of the industry, and in turn will keep the industry constantly informed.

The total value of the oil and natural gas produced in the United States during the calendar year 1914 was more than $300,000,000. The total waste in all branches of the industry probably amounted to $50,000,000. These figures show how great a saving of national wealth may be effected by enlarging and continuing the work for greater efficiency that the bureau has now begun.

NEED OF INCREASED FACILITIES AT PITTSBURGH STATION.

The equipment now in the old buildings on the arsenal grounds in Pittsburgh should be moved to the new experiment station in that city and new equipment should be contracted for as work progresses on the buildings and the equipment can be installed most economically. The sum required for the purpose is less than was appropriated for moving equipment during the last fiscal year.

At the new buildings in Pittsburgh provision should be made for such additional service by skilled artisans, charwomen, and others as will assure proper care of the buildings and to provide for its equipment and furnishings being kept in proper condition and not allowed to deteriorate.

NEED OF LARGER PRINTING FUNDS.

The publications of the bureau represent the results of work conducted under appropriations made by Congress. Through them chiefly both Congress and the public are informed of methods devised and recommendations made for safeguarding life and bringing about more healthful conditions in the mining and metallurgical industries and for insuring more efficient and economical development of the Nation's mineral resources.

As stated elsewhere in this report, Congress has greatly extended the scope of the inquiries and investigations conducted by the Bureau of Mines, and the demands made on the bureau by the Government and by the public have continually increased in number and urgency. In consequence of the enlargement of the bureau's duties and the increase in the scope and number of the investigations it has been directed to make, there has been a steady increase in the number of reports submitted for publication. Although these reports deal

with investigations that relate to safeguarding the lives of miners and of workers in metallurgical establishments, preventing accidents and bringing about more healthful conditions in mines, mills, and smelters, and increasing the national wealth through the elimination of mineral wastes and the production of metals and minerals from deposits now unworked, the bureau has been unable to publish many of them as promptly as their importance and timeliness demanded. Meanwhile the bureau, in efforts to make its printing funds go as far as possible, has reduced the number of copies of reports printed for free distribution, although by so doing it has restricted such a distribution of the results of its investigations as would make these results of most use to the public. Editions of some publications have been exhausted within a few weeks of issue.

The movement for greater safety and efficiency in the mineral industries has developed chiefly within the past few years. Its success depends on the cooperation of all agencies working for the same end, and to insure this cooperation the results of the bureau's work should be readily available. An increase of funds for printing reports, especially those that relate to saving the lives of miners, is strongly recommended.

SUMMARY OF THE MORE URGENT NEEDS OF THE BUREAU.

Below is a summarized statement indicating the sums necessary for extending investigations or improving equipment or facilities during the fiscal year 1917. No reference is made to investigations for which no increase from last year's appropriation is asked.

Sums necessary for important features of the bureau's work in the fiscal year 1917.

	1916.	1917.
General expenses	$70,000	$74,800
Petroleum and natural gas investigations	35,000	70,000
Mining-experiment stations	------	70,000
Additional services Pittsburgh station	------	17,220
Repairs for cars	------	21,000
Purchase of 3 new cars	------	53,280
Equipment for 3 new cars	------	13,500
Cost of operating 3 new cars	------	54,510

OFFICES AND BUILDINGS.

The headquarters of the bureau are in a rented building, situated on E Street between Seventh and Eighth Streets, in the city of Washington. A large building to house the offices of the Secretary of the Interior, the General Land Office, the United States Geological Survey, the Reclamation Service, and the Bureau of Mines is to be erected in Washington on a plot of ground lying between Eighteenth and Nineteenth and F and G Streets. Contracts for the construction of this building have been prepared and work on it will soon be started.

The experiment station at Pittsburgh is housed in the unsuitable and overcrowded buildings on the arsenal grounds of the War Department at Fortieth and Butler Streets. Temporary provisions for some of the investigations have been made with the Carnegie Institute of Technology. During the previous year plans were pre-

ORGANIZATION OF THE BUREAU OF MINES.

GENERAL PLAN OF ORGANIZATION.

Each year since the Bureau of Mines was established it has been called on to extend its activities and to conduct fresh investigations coming within the scope of the terms of its organic act. New inquiries have been authorized by Congress, old ones have been broadened, and cooperative working agreements have been made with State organizations and with other bureaus of the Government. In consequence there have been changes in the organization of the bureau. The organization in force at the end of the year is described below and is shown on the diagram facing page 624.

As the chart indicates, the investigations of the bureau are grouped under five principal divisions, as follows: Mining division, metallurgical division, mineral-technology division, fuels and mechanical-equipment division, and petroleum division. The chemical-research laboratory at Pittsburgh, Pa., performed work for each of these divisions. Immediately under the director, who supervises the work of the bureau, are the administrative officers as indicated on the chart.

PERSONNEL OF DIFFERENT DIVISIONS.

ADMINISTRATIVE DIVISION.

The general administrative work was in charge of the director, Joseph A. Holmes, and the assistant director, Van. H. Manning, at the headquarters of the bureau in Washington, D. C. The local administration of the mining-experiment station at Pittsburgh was intrusted to H. M. Wilson. F. G. Cottrell, chief chemist, acted as administrative head of the San Francisco, Cal., office of the bureau. R. B. Moore, physical chemist, acted in a similar capacity for the Denver, Colo., office.

F. G. Bailey, assistant chief clerk, was in charge of routine administrative matters at the Washington office. J. W. Thompson and C. B. Dutton, law examiners; J. L. Cochrane, in charge of the distribution of publications; S. Sanford, engineer, in charge of editorial work; and A. H. Fay, mining engineer, charged with the collection of mine-accident statistics, were also stationed at the Washington office.

In addition to these investigations various others that relate to safety or efficiency in the mineral industries are being conducted under the direct supervision of the director, who also has general supervision of the work of the Federal mine inspector for Alaska, and the inspection of coal mines on Indian or Government lands in Oklahoma and Wyoming.

The director in the conduct of the technical work of the bureau has the benefit of the advice of the advisory committee, consisting of

the chiefs of the different divisions, and of the consulting experts connected with the bureau.

Such administrative functions as the general supervision of the bureau's library and the conduct of its affairs with respect to matters of personnel, supplies, and accounting are centered at the Washington office under the supervision of the director.

MINING DIVISION.

The field activities of the mining division, including all investigative, rescue, and training work, are conducted under an organization by which the country is divided into 10 districts. George S. Rice, chief mining engineer, with offices in Pittsburgh, is in charge of the division and gives personal attention to the field investigations.

J. W. Paul, mining engineer, stationed at Pittsburgh, is in charge of mine-rescue operations and of the testing of all mine-rescue apparatus and mine-safety lamps.

H. M. Wilson, in addition to his duties as engineer in charge of the Pittsburgh station, had supervision of the educational work, the training of miners, and the demonstrations given the mine-rescue cars and stations.

The districts in which the field forces operate, the name of the engineer in charge of each district, and his headquarters are given on pages 647–649.

Sumner S. Smith, mining engineer, served as Federal mine inspector for the Territory of Alaska, with headquarters at Juneau, Alaska.

Special investigations undertaken by the mining division and the names of the officials in charge are outlined below:

Tests of different types of mine-rescue apparatus, J. W. Paul, mining engineer.

Tests of methods of preventing explosions and various tests of mine equipment, all conducted at the experimental mine near Bruceton, Pa., L. M. Jones, mining engineer.

Methods and costs of open-pit mining at Santa Rita, N. Mex., Charles Enzian, mining engineer, in cooperation with D. F. MacDonald, geologist, of the United States Geological Survey.

Subsidence from coal mining in the Scranton district, Pa., Charles Enzian, mining engineer.

Investigations of coal-mine gases, in cooperation with State of Illinois, H. I. Smith, assistant mining engineer. and R. J. Hamon, chemist.

Use of permissible explosives in Illinois, J. R. Fleming, assistant mining engineer, who succeeded J. W. Koster, junior mining engineer, in January, 1915.

Use of permissible explosives and inspection of mines on Indian lands in Oklahoma, J. J. Rutledge, mining engineer.

Investigations of health and safety conditions in the mines of California, in cooperation with State of California, H. M. Wolflin, mining engineer.

Siliceous rock dust in mines as a cause of pulmonary diseases among miners, with especial reference to mines in the Joplin district, Mo., Edwin Higgins, mining engineer, in collaboration with A. J. Lanza, passed assistant surgeon of the Public Health Service.

General health and sanitary conditions in mines and mining communities, J. H. White, sanitary engineer.

First-aid instruction for miners, W. A. Lynott, mine surgeon.

Chemical tests of mine explosives, C. G. Storm, chemist, who resigned June 15, 1915.

Inspection of coal mines on Government land in Wyoming, J. C. Roberts, mining engineer.

Physical tests of mine explosives, S. P. Howell, explosives engineer.

FUELS AND MECHANICAL-EQUIPMENT DIVISION.

The fuels and mechanical-equipment division is under the supervision of O. P. Hood, chief mechanical engineer.

The investigations undertaken during the year and the officials in charge were as follows:

General fuel investigations, O. P. Hood, chief mechanical engineer.

Inspection of Government fuel purchases, G. S. Pope, engineer.

Fuel efficiency, S. B. Flagg, engineer.

Electricity in mines, H. H. Clark, electrical engineer.

Mine equipment, O. P. Hood, chief mechanical engineer.

Mine-rescue apparatus, W. E. Gibbs, engineer of special research, assisted by Yandell Henderson, consulting surgeon.

Gas-producer investigations, with especial reference to the slagging type of producer, C. D. Smith, engineer.

Origin of peat and uses of peat and lignite, C. A. Davis, fuel technologist.

General investigation of the increase of efficiency in gas-producer design and practice, R. H. Fernald, consulting engineer.

Physical investigations relating to fuels, etc., J. K. Clement, physicist.

Analysis of coal purchased for the Government, J. D. Davis, chemist.

Investigation of the coking of coal and of coke by-products, H. C. Porter, chemist.

Deterioration and spontaneous combustion of coal in storage, H. C. Porter.

DIVISION OF MINERAL TECHNOLOGY.

The work of the Division of Mineral Technology was under the direction of Charles L. Parsons, chief mineral technologist. The investigations pursued during the year and the officials in charge were as follows:

Rare-metal investigations, including work done in cooperation with the National Radium Institute; mining of carnotite ore, K. L. Kithil, mineral technologist, and J. A. Davis, assistant mining engineer; operation of radium plant, R. B. Moore, physical chemist.

Study of tungsten ores and platinum resources, K. L. Kithil, mineral technologist.

Study of molybdenum deposits and concentration of molybdenum ores, F. W. Horton, mineral technologist.

Investigations of nonferrous alloys, with particular attention to preventing metal losses in brass melting, H. W. Gillett, alloy chemist.

Ceramic-industry investigations, C. L. Parsons, chief mineral technologist, A. S. Watts, consulting quarry technologist, and Ira Sproat, junior ceramic chemist.

Building-stone technology, with special reference to the quarrying of marble, O. W. Bowles, quarry technologist.

PETROLEUM DIVISION.

The petroleum division is under the supervision of W. A. Williams, chief petroleum technologist. The investigations undertaken and the bureau officials in direct charge were as follows:

"Cracking" of mineral oils by heat, with especial reference to more efficient and cheaper methods of producing gasoline, benzol, and toluol, W. F. Rittman, chemical engineer.

Losses of oil during storage in tanks, and fire hazards, A. G. Heggem, petroleum engineer.

Fractionation of oil from oil shales, David T. Day, consulting chemist.

Cooperative work with the Department of Justice in relation to oil lands in California, J. H. G. Wolf, petroleum engineer.

Introduction of mud-fluid method of drilling in Oklahoma, Indiana, Ohio, Illinois, and West Virginia, J. A. Pollard, gas-waste engineer.

Investigation of natural-gas industry in California, Oklahoma, Kansas, Ohio, Pennsylvania, West Virginia, and Texas, W. M. Welch, gas-waste engineer.

Analytical distillation of petroleum, E. W. Dean, junior organic chemist.

Analysis and testing of fuel oil and other petroleum products, W. A. Jacobs, junior chemist.

Determination of coefficients of expansion of California crude oils and distillates A. S. Crossfield, junior explosives chemist.

METALLURGICAL DIVISION.

The metallurgical division is under the supervision of F. G. Cottrell, chief chemist, with headquarters at San Francisco, Cal. The investigations of this division and the officials in direct charge were as follows:

Smelter fumes, L. H. Duschak, chemical engineer, and A. E. Wells, metallurgist, under the direct supervision of the chief chemist.

Hydrometallurgy of gold and silver ores, G. H. Clevenger, consulting metallurgist.

Mining and milling methods in lead and zinc mines, C. A. Wright, assistant metallurgical engineer.

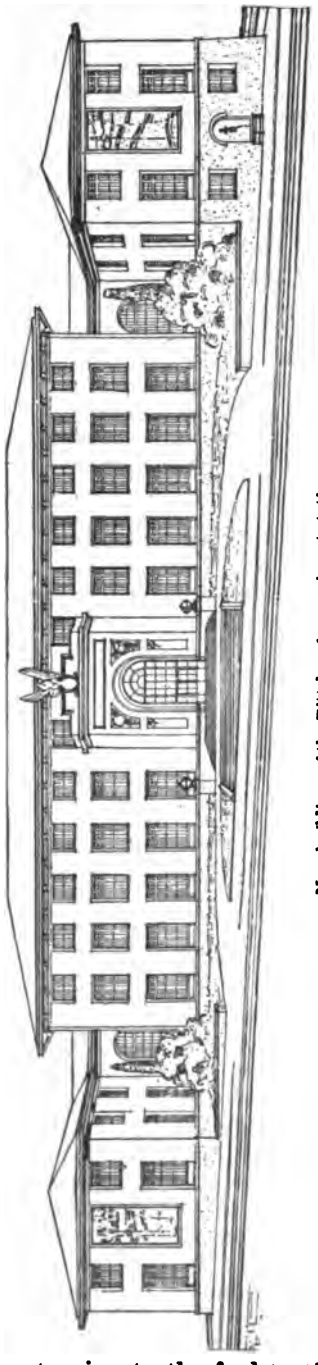
Treatment of low-grade ores in the State of Utah, in cooperation with the University of Utah, D. A. Lyon, metallurgist.

Safety and efficiency at blast furnaces, F. H. Willcox, metallurgical engineer.

Safety and efficiency in steel manufacturing, J. M. Sampson, iron and steel metallurgist, who resigned February 1, 1915, and was succeeded by James Aston, metallurgical engineer.

Corrosion of metals in mines, O. W. Storey, chemist.

pared for new buildings authorized by Congress, and during the past year contracts were let and ground broken for their construction. These buildings will stand on land acquired by the Government, an admirable site adjacent to the grounds of the Carnegie Institute of Technology and near the Carnegie Institute, the Carnegie Library, and the University of Pittsburgh. The tract fronts to the north on Forbes Street, and is immediately east of the Forbes Street Bridge over the deep cut of the Pittsburgh Junction Railroad, which bounds the property on the west.

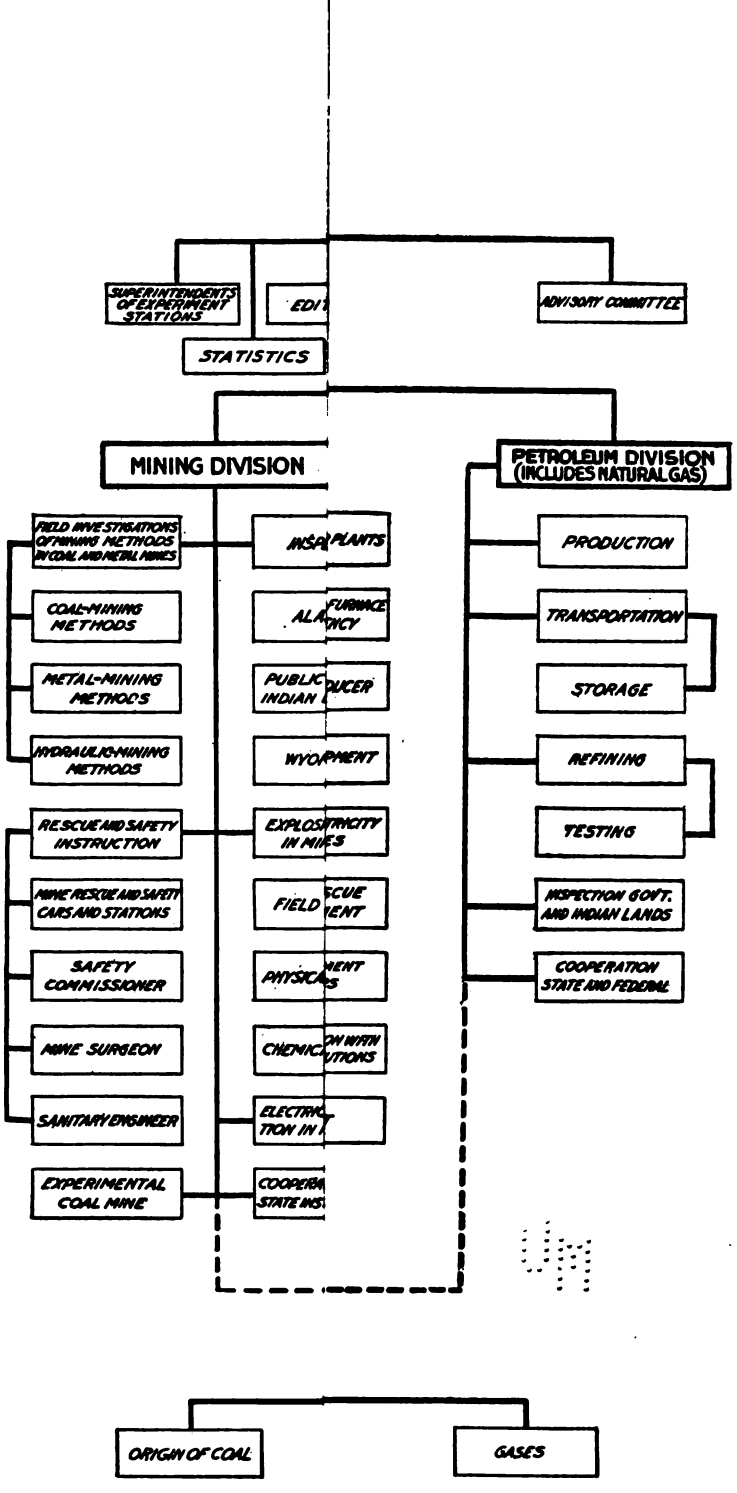


New buildings of the Pittsburgh experiment station.

The main building is three stories high, has a frontage of 332 feet, and is flanked at either end with two-story wings that extend back from Forbes Street 211 feet. The general appearance of the building will be plain but dignified. The basement walls are of concrete with a tooled surface, resembling light-gray granite. For the rest the exterior walls are of cream brick to harmonize with monumental buildings of the neighborhood and are crowned with a wide projecting cornice and a low slate roof.

The central part of the building, which is 56 feet by 210 feet, will contain quarters for the administration offices and the mining-engineering division and also a lecture room seating 300 persons. The west wing, 48 by 211 feet, will house the mechanical laboratory. The east wing, of the same size, will accommodate the chemical laboratory. In general the interior finish is substantial but severely plain.

In the rear of the main building will be the power plant and the metallurgical and fuel-testing laboratories in a building 55 feet by 220 feet, built of reinforced concrete and placed on a lower level so as to be invisible from Forbes Street. In this building are an engine house 55 feet by 110 feet, a fuel-testing laboratory 55 feet by 70 feet, and a metallurgical testing laboratory 55 feet by 70 feet. An extension of this building is contemplated to provide a boiler house 55 feet by 110 feet and a 50-foot extension to the fuel-testing laboratory. The general appearance of the buildings is shown in the figure.


SUPERINTENDENTS OF EXPERIMENT STATIONS
EDI
ADVISORY COMMITTEE
STATISTICS
MINING DIVISION
PETROLEUM DIVISION (INCLUDES NATURAL GAS)
FIELD INVESTIGATIONS OF MINING METHODS IN COAL AND METAL MINES
COAL-MINING METHODS
METAL-MINING METHODS
HYDRAULIC-MINING METHODS
RESCUE AND SAFETY INSTRUCTION
MINE RESCUE AND SAFETY CARS AND STATIONS
SAFETY COMMISSIONER
MINE SURGEON
SANITARY ENGINEER
EXPERIMENTAL COAL MINE
PLANTS
PUBLIC
INDIAN
WYO
EXPLOS
IN MINES
FIELD
PHYSICA
CHEMIC
ELECTRI
TION IN
COOPERA
STATE INS
PRODUCTION
TRANSPORTATION
STORAGE
REFINING
TESTING
INSPECTION GOVT. AND INDIAN LANDS
COOPERATION STATE AND FEDERAL
ORIGIN OF COAL
GASES

Besides the buildings under contract and such extensions as may be constructed within the present appropriation of $500,000, additional buildings will undoubtedly be needed to enable the bureau to carry out the investigations demanded of it.

One of the earliest future needs will be a service building to house all of the shops which otherwise will occupy space in the mechanical laboratory and also a storeroom in order to release valuable space in the basement of the mining-engineering building.

It is altogether probable that the growth of metallurgical investigations will before long render the metallurgical building inadequate and that extensions of the fuel-testing laboratory will be needed.

The Denver experiment station occupies rented quarters in an office building and the San Francisco experiment station has offices in the customhouse and is making use of temporary laboratory facilities provided by a cooperative arrangement at the Panama-Pacific Exposition.

At Salt Lake City the bureau occupies quarters provided by the University of Utah under a cooperative agreement and at Urbana, Ill., the bureau has an office in one of the buildings of the University of Illinois.

In order to make more effective its efforts to increase safety and efficiency in the mineral industries the bureau has made cooperative agreements with various Government bureaus and various State institutions and departments, and in order to use in the conduct of necessary investigations special and expensive equipment that could not be procured with the limited funds available, the bureau has made such agreements with the National Radium Institute and other organizations.

An act passed at the last session of Congress authorized the establishment of Government mining-experiment and mine-safety stations at localities to be selected by the Secretary of the Interior, these stations to be under the technical supervision of the Bureau of Mines. No funds for the construction of these stations were appropriated.

ORGANIZATION OF THE BUREAU OF MINES.

GENERAL PLAN OF ORGANIZATION.

Each year since the Bureau of Mines was established it has been called on to extend its activities and to conduct fresh investigations coming within the scope of the terms of its organic act. New inquiries have been authorized by Congress, old ones have been broadened, and cooperative working agreements have been made with State organizations and with other bureaus of the Government. In consequence there have been changes in the organization of the bureau. The organization in force at the end of the year is described below and is shown on the diagram facing page 624.

As the chart indicates, the investigations of the bureau are grouped under five principal divisions, as follows: Mining division, metallurgical division, mineral-technology division, fuels and mechanical-equipment division, and petroleum division. The chemical-research laboratory at Pittsburgh, Pa., performed work for each of these divisions. Immediately under the director, who supervises the work of the bureau, are the administrative officers as indicated on the chart.

PERSONNEL OF DIFFERENT DIVISIONS.

ADMINISTRATIVE DIVISION.

The general administrative work was in charge of the director, Joseph A. Holmes, and the assistant director, Van. H. Manning, at the headquarters of the bureau in Washington, D. C. The local administration of the mining-experiment station at Pittsburgh was intrusted to H. M. Wilson. F. G. Cottrell, chief chemist, acted as administrative head of the San Francisco, Cal., office of the bureau. R. B. Moore, physical chemist, acted in a similar capacity for the Denver, Colo., office.

F. G. Bailey, assistant chief clerk, was in charge of routine administrative matters at the Washington office. J. W. Thompson and C. B. Dutton, law examiners; J. L. Cochrane, in charge of the distribution of publications; S. Sanford, engineer, in charge of editorial work; and A. H. Fay, mining engineer, charged with the collection of mine-accident statistics, were also stationed at the Washington office.

In addition to these investigations various others that relate to safety or efficiency in the mineral industries are being conducted under the direct supervision of the director, who also has general supervision of the work of the Federal mine inspector for Alaska, and the inspection of coal mines on Indian or Government lands in Oklahoma and Wyoming.

The director in the conduct of the technical work of the bureau has the benefit of the advice of the advisory committee, consisting of

the chiefs of the different divisions, and of the consulting experts connected with the bureau.

Such administrative functions as the general supervision of the bureau's library and the conduct of its affairs with respect to matters of personnel, supplies, and accounting are centered at the Washington office under the supervision of the director.

MINING DIVISION.

The field activities of the mining division, including all investigative, rescue, and training work, are conducted under an organization by which the country is divided into 10 districts. George S. Rice, chief mining engineer, with offices in Pittsburgh, is in charge of the division and gives personal attention to the field investigations.

J. W. Paul, mining engineer, stationed at Pittsburgh, is in charge of mine-rescue operations and of the testing of all mine-rescue apparatus and mine-safety lamps.

H. M. Wilson, in addition to his duties as engineer in charge of the Pittsburgh station, had supervision of the educational work, the training of miners, and the demonstrations given the mine-rescue cars and stations.

The districts in which the field forces operate, the name of the engineer in charge of each district, and his headquarters are given on pages 647–649.

Sumner S. Smith, mining engineer, served as Federal mine inspector for the Territory of Alaska, with headquarters at Juneau, Alaska.

Special investigations undertaken by the mining division and the names of the officials in charge are outlined below:

Tests of different types of mine-rescue apparatus, J. W. Paul, mining engineer.

Tests of methods of preventing explosions and various tests of mine equipment, all conducted at the experimental mine near Bruceton, Pa., L. M. Jones, mining engineer.

Methods and costs of open-pit mining at Santa Rita, N. Mex., Charles Enzian, mining engineer, in cooperation with D. F. MacDonald, geologist, of the United States Geological Survey.

Subsidence from coal mining in the Scranton district, Pa., Charles Enzian, mining engineer.

Investigations of coal-mine gases, in cooperation with State of Illinois, H. I. Smith, assistant mining engineer, and R. J. Hamon, chemist.

Use of permissible explosives in Illinois, J. R. Fleming, assistant mining engineer, who succeeded J. W. Koster, junior mining engineer, in January, 1915.

Use of permissible explosives and inspection of mines on Indian lands in Oklahoma, J. J. Rutledge, mining engineer.

Investigations of health and safety conditions in the mines of California, in cooperation with State of California, H. M. Wolflin, mining engineer.

Siliceous rock dust in mines as a cause of pulmonary diseases among miners, with especial reference to mines in the Joplin district, Mo., Edwin Higgins, mining engineer, in collaboration with A. J. Lanza, passed assistant surgeon of the Public Health Service.

General health and sanitary conditions in mines and mining communities, J. H. White, sanitary engineer.

First-aid instruction for miners, W. A. Lynott, mine surgeon.

Chemical tests of mine explosives, C. G. Storm, chemist, who resigned June 15, 1915.

Inspection of coal mines on Government land in Wyoming, J. C. Roberts, mining engineer.

Physical tests of mine explosives, S. P. Howell, explosives engineer.

FUELS AND MECHANICAL-EQUIPMENT DIVISION.

The fuels and mechanical-equipment division is under the supervision of O. P. Hood, chief mechanical engineer.

The investigations undertaken during the year and the officials in charge were as follows:

General fuel investigations, O. P. Hood, chief mechanical engineer.

Inspection of Government fuel purchases, G. S. Pope, engineer.

Fuel efficiency, S. B. Flagg, engineer.

Electricity in mines, H. H. Clark, electrical engineer.

Mine equipment, O. P. Hood, chief mechanical engineer.

Mine-rescue apparatus, W. E. Gibbs, engineer of special research, assisted by Yandell Henderson, consulting surgeon.

Gas-producer investigations, with especial reference to the slagging type of producer, C. D. Smith, engineer.

Origin of peat and uses of peat and lignite, C. A. Davis, fuel technologist.

General investigation of the increase of efficiency in gas-producer design and practice, R. H. Fernald, consulting engineer.

Physical investigations relating to fuels, etc., J. K. Clement, physicist.

Analysis of coal purchased for the Government, J. D. Davis, chemist.

Investigation of the coking of coal and of coke by-products, H. C. Porter, chemist.

Deterioration and spontaneous combustion of coal in storage, H. C. Porter.

DIVISION OF MINERAL TECHNOLOGY.

The work of the Division of Mineral Technology was under the direction of Charles L. Parsons, chief mineral technologist. The investigations pursued during the year and the officials in charge were as follows:

Rare-metal investigations, including work done in cooperation with the National Radium Institute; mining of carnotite ore, K. L. Kithil, mineral technologist, and J. A. Davis, assistant mining engineer; operation of radium plant, R. B. Moore, physical chemist.

Study of tungsten ores and platinum resources, K. L. Kithil, mineral technologist.

Study of molybdenum deposits and concentration of molybdenum ores, F. W. Horton, mineral technologist.

Investigations of nonferrous alloys, with particular attention to preventing metal losses in brass melting, H. W. Gillett, alloy chemist.

Ceramic-industry investigations, C. L. Parsons, chief mineral technologist, A. S. Watts, consulting quarry technologist, and Ira Sproat, junior ceramic chemist.

Building-stone technology, with special reference to the quarrying of marble, O. W. Bowles, quarry technologist.

PETROLEUM DIVISION.

The petroleum division is under the supervision of W. A. Williams, chief petroleum technologist. The investigations undertaken and the bureau officials in direct charge were as follows:

"Cracking" of mineral oils by heat, with especial reference to more efficient and cheaper methods of producing gasoline, benzol, and toluol, W. F. Rittman, chemical engineer.

Losses of oil during storage in tanks, and fire hazards, A. G. Heggem, petroleum engineer.

Fractionation of oil from oil shales, David T. Day, consulting chemist.

Cooperative work with the Department of Justice in relation to oil lands in California, J. H. G. Wolf, petroleum engineer.

Introduction of mud-fluid method of drilling in Oklahoma, Indiana, Ohio, Illinois, and West Virginia, J. A. Pollard, gas-waste engineer.

Investigation of natural-gas industry in California, Oklahoma, Kansas, Ohio, Pennsylvania, West Virginia, and Texas, W. M. Welch, gas-waste engineer.

Analytical distillation of petroleum, E. W. Dean, junior organic chemist.

Analysis and testing of fuel oil and other petroleum products, W. A. Jacobs, junior chemist.

Determination of coefficients of expansion of California crude oils and distillates A. S. Crossfield, junior explosives chemist.

METALLURGICAL DIVISION.

The metallurgical division is under the supervision of F. G. Cottrell, chief chemist, with headquarters at San Francisco, Cal. The investigations of this division and the officials in direct charge were as follows:

Smelter fumes, L. H. Duschak, chemical engineer, and A. E. Wells, metallurgist, under the direct supervision of the chief chemist.

Hydrometallurgy of gold and silver ores, G. H. Clevenger, consulting metallurgist.

Mining and milling methods in lead and zinc mines, C. A. Wright, assistant metallurgical engineer.

Treatment of low-grade ores in the State of Utah, in cooperation with the University of Utah, D. A. Lyon, metallurgist.

Safety and efficiency at blast furnaces, F. H. Willcox, metallurgical engineer.

Safety and efficiency in steel manufacturing, J. M. Sampson, iron and steel metallurgist, who resigned February 1, 1915, and was succeeded by James Aston, metallurgical engineer.

Corrosion of metals in mines, O. W. Storey, chemist.

CHEMICAL-RESEARCH LABORATORY.

The chemical-research laboratory at Pittsburgh is under the supervision of J. K. Clement, physical chemist, with G. A. Hulett as consulting chemist.

At this laboratory, in addition to a large amount of routine work for investigations conducted by other divisions, the following special investigations were carried on:

Investigation of the origin of coal, H. C. Porter, chemist, and R. Thiessen, assistant chemist.

Investigation of mine gases and of natural gas, G. A. Burrell, chemist, assisted by F. M. Seibert, assistant chemist, and I. W. Robertson and G. G. Oberfell, junior chemists.

Clinkering of coal and fusing temperature of coal ash, A. C. Fieldner, chemist, assisted by A. E. Hall, assistant chemist, and A. L. Feild, junior physical chemist.

Investigation of the volatile products of coal, H. C. Porter, chemist, and F. K. Ovitz, assistant chemist.

OTHER INVESTIGATIONS.

A number of investigations and inquiries have been conducted for various periods of time under the immediate supervision of the director, and hence do not fall within any of the divisions mentioned. These investigations are as follows:

Iron mining in the United States, D. E. Woodbridge, consulting engineer.

Development of iron making in the United States, John Birkinbine, metallurgical engineer, and J. L. W. Birkinbine, consulting metallurgical engineer.

Production of alloy steels, H. D. Hibbard, steel metallurgist.

Gold dredging and placer mining, Charles Janin, consulting mining engineer.

Methods of utilizing lignite, in cooperation with the University of North Dakota, E. J. Babcock, assistant engineer.

Metallurgical practice in the United States, C. H. Fulton, consulting metallurgist.

Sampling and assaying methods, T. R. Woodbridge, Edward Keller, and W. J. Sharwood, consulting metallurgical chemists.

Improvements in gas-producer design and practice, R. H. Fernald, engineer.

Proposed rules for metal mines, W. R. Ingalls, John Hays Hammond, James Douglas, J. Parke Channing, and J. R. Finlay, consulting engineers.

PROGRESS OF INVESTIGATIONS.

Some of the most notable accomplishments of the past fiscal year and a general review of the bureau's progress have been given. The purpose of the different investigations, the results achieved, and the significance of these results are stated in detail on succeeding pages.

WORK OF MINING DIVISION.

The organization of the mining division and the names of the officials in charge of specific investigations have been described elsewhere (pp. 627–630).

All of the district engineers gave or supervised instruction in mine-rescue and first-aid training, responded to the requests of operators and miners for information, and gave valuable assistance at explosion disasters and at mine fires. They were ably assisted by the foremen miners and the first-aid miners, who in many instances, in the absence of their district chief, proceeded effectively to accomplish the work in hand.

Some of the district engineers were so much occupied with training miners and supervising cars and stations that they were unable to do much investigative work; a number were detailed to special investigations, and during such times the routine work was in charge of the foremen miners.

INVESTIGATIONS AT PITTSBURGH AND EXPERIMENTAL MINE.

STUDY OF RESCUE APPARATUS AND SAFETY LAMPS.

J. W. Paul, mining engineer, with the assistance of H. D. Mason, jr., assistant mining engineer, continued to study the use of mine-rescue apparatus and the merits of different types of rescue apparatus and safety lamps.

EXPLOSIBILITY TESTS OF COAL DUST.

L. M. Jones, mining engineer, under the general supervision of the chief mining engineer, carried on at the bureau's experimental mine at Bruceton, Pa., a series of explosion tests. The results promise to be of great value. Standardization of the methods by which the inflammability of coal dust from typical mines are tested, with and without the presence of fire damp, and by which the amount of rock dust or other inert matter that must be added to make the coal dust safe is determined with reasonable precision, is the main feature of this work. Such direct information enables operators to know what is needed to make their mines reasonably safe from explosions.

OPEN-PIT MINING AND SURFACE SUPPORT.

Charles Enzian, mining engineer, cooperated with D. F. MacDonald, a geologist assigned to the Bureau of Mines from the United States Geological Survey, to investigate open-pit mining at Santa

Rita, N. Mex. A joint report of the investigations has been prepared. Mr. Enzian also continued an investigation of subsidence from coal mining in the Scranton district, Pa., and was called upon by the city of Scranton to make recommendations regarding proposed methods of supporting the surface.

ILLINOIS COOPERATIVE INVESTIGATIONS.

H. I. Smith, assistant mining engineer, was the bureau's representative in Illinois under a cooperative agreement between the State and the Bureau of Mines. Mr. Smith investigated the condition of the air in coal mines, a report on which is in progress.

A report by R. Y. Williams, former mining engineer of the bureau, on the humidity of mine air, with especial reference to coal mines in southern Illinois, was published during the year, and a second report on ventilation stoppings in Illinois mines is in press.

R. J. Hamon, chemist, who was assigned to this cooperative work, opened a laboratory for the analysis of mine-air samples at Urbana, Ill., where he made a large number of analyses, the reports of which are being tabulated for publication.

J. R. Fleming, assistant mining engineer, who was assigned to the Illinois work January 1, 1915, continued the work begun by J. W. Koster, junior mining engineer, on the use of permissible explosives in Illinois. A report is being prepared on this subject. Mr. Fleming also did some work in Indiana in cooperation with the Indiana mine inspection department.

USE OF EXPLOSIVES IN OKLAHOMA.

J. J. Rutledge, mining engineer, assisted by J. W. Koster and others, in the early part of the fiscal year conducted tests on the use of permissible explosives in Oklahoma. Subsequently every mine on the segregated land of the Indian tribes was visited and inspected by Mr. Rutledge and D. Harrington, mining engineer, during the latter part of the fiscal year. The purpose of this investigation was to determine how the mines could best conform to the order of the Secretary of the Interior requiring the use of permissible explosives, or the alternative of shot firing from the surface, with a view to lessening the large number of shot-firing explosions accompanied by loss of life or damage to property. Copies of the preliminary reports on the inspections were submitted to the operators for approval or criticism. Many of the operators conceded the desirability of adopting the recommendations and of conforming to the Secretary's orders. Some operators pleaded for delay on account of the bad condition of business, but none showed a disposition to refuse to meet the Secretary's orders though some question was raised as to the practicability of the means suggested. Recommendations are being prepared. At some mines it was found that by certain modifications in methods the purposes of the Secretary's orders could be fulfilled without literal compliance, as in the steep-pitching but naturally wet mines.

CALIFORNIA COOPERATIVE AGREEMENT.

In California H. M. Wolflin, mining engineer, continued in charge of inquiries under a cooperative agreement with the California State

Industrial Commission regarding safety precautions in metal mines. Most of the larger mines were examined, and a comprehensive mining law is now being formulated by the Industrial Commission for submission to the State legislature. The cooperation has yielded valuable results during the past year and promises to be still more valuable because of the extremely liberal attitude taken by the commission.

HEALTH INVESTIGATIONS IN JOPLIN DISTRICT.

Edwin Higgins, mining engineer, during a part of the year, in cooperation with A. J. Lanza, passed assistant surgeon, of the Public Health Service, made a special investigation of the effect of rock dust in the sheet-ground zinc and lead mines of the Joplin district.

New methods for the collection of samples of dust in mine air were devised by Mr. Higgins, assisted by Messrs. Rice, Fieldner. and Burrell, which have proven effective.

Great good was accomplished by the cooperative work because both operators and miners took up suggested improvements with interest and energy, and marked improvement was made in many of the mines that contained the most dust. Although it is not expected that the lessening of silicosis, or miners' asthma, and of tuberculosis will be evident for a year or more, the cooperative work is expected to have a marked influence on the health of miners in the Joplin district hereafter.

The measures advocated were employment of water-injection drills, placing of pipe lines and hose and spraying of dust, forbidding the squibbing of holes and the use of adobe shots except at the middle or end of a shift, as well as general improvement in hygienic conditions such as would result from the erection of wash and change houses.

OTHER METAL-MINE INVESTIGATIONS.

Although some other work was occasionally done by several of the mining engineers in metal-mining fields, the lack of larger appropriations for this class of mining prevented little more being done than the work indicated. It is to be hoped that in the future more investigation of safety in metal mining will be possible. It is regretted that the lack of funds prevented the continuance of tests of mine supports for both coal and metal mines, and it is hoped that this work will be taken up again in the future.

WORK OF CAR 8.

During the year mine-rescue car 8 was equipped with a full crew, in charge of D. J. Parker, mining engineer, the crew including a mine surgeon, Dr. W. A. Lynott, a foreman miner, a first-aid miner, a stenographer, and a cook. The car proceeded from mining town to mining town, the mining engineer investigating mines, giving lectures, and supervising the work of the crew. The surgeon investigated health conditions at mines, and the foreman miner and first-aid miner gave training in rescue methods and in first aid. A large number of men were trained, and the car was also called to a num-

ber of explosion disasters. It is hoped that sufficient funds will be provided to enable similar work to be done by each car.

SPECIAL WORK OF CHIEF MINING ENGINEER.

The chief mining engineer designed certain rock-dust barriers to prevent or check mine explosions. Application for patents covering the barriers has been made, and the patents, if granted, will be dedicated to the public. Mr. Rice also gave special attention to the introduction of permissible explosives in Oklahoma, and at the request of the Wisconsin Industrial Commission and the city engineer of Milwaukee, investigated a tunnel at Milwaukee, Wis., in which a fall of roof had occurred. The use of bulkheads in the tunnel to prevent accidents from flooding by an inrush of water from Lake Michigan, under which the tunnel was being driven. was recommended, and was adopted bv the authorities.

MINE SANITATION.

The purpose of the sanitary investigations conducted was the conservation of health by encouraging better conditions at mines and mining communities. About 60 industrial communities in the Western States were investigated by J. H. White, sanitary engineer. A bulletin by Mr. White on houses for mining towns was issued; a technical paper on miners' wash and change houses was submitted for publication; and a bulletin entitled "Administration of Industrial Communities" is being prepared. Mr. White also prepared for the Panama-Pacific International Exposition an exhibit designed to show the progress being made in improving the living conditions of mine workers.

MINE-ACCIDENT STATISTICS.

Accurate statistics of mine accidents are essential to the development of intelligent plans for bringing about greater safety in mining. The collection and publication of such statistics by the Bureau of Mines under a cooperative arrangement with State or county inspectors has proved decidedly satisfactory, for the cooperation has assured reports that are accurate and are compiled in a uniform manner. This uniformity is highly desirable, because it permits intelligent comparison of the records of various States and thus saves time and expense to the Government, to State authorities, and to mining companies. Under the present arrangement the bureau publishes a monthly statement of coal-mine fatalities, and also prints an annual report on such fatalities within two months after the end of the calendar year.

A large bulletin, in which over 50,000 fatalities in coal mines have been tabulated by causes and calendar years, is being prepared. The figures include the returns from each State since the beginning of inspection service to the end of 1914, so that for the first time coal-mine fatalities for all of the States are assembled on a calendar-year basis and under a uniform classification.

Reliable classified data relating to accidents in metal and miscellaneous mineral mining in the United States are still lacking. Only a few metal-mining States have inspection service, and the reports of

inspectors in different States are not uniform. Moreover, one State requires inspectors to collect certain information, whereas the requirements of another State are entirely different. Some States do not require a record of injuries or a report to any individual, insurance board, commissioner, or inspector, whereas other States have strictly enforced laws requiring such reports. In addition, the fiscal years of States are not uniform. Unless all States report on the same basis, just comparisons can not be made. It is hoped that during this coming year a bulletin on metal-mine accidents can be prepared, similar to the one on coal-mine accidents above mentioned.

During the year, in addition to the reports on coal-mine accidents, a report on accidents in metal mines, and a report on accidents in quarries, each for the calendar year 1913, were published; also a report on the production of explosives in the United States during 1913 was printed, and a report on the production of explosives during 1914 was submitted for publication. A report on accidents at coke ovens during the calendar years 1913 and 1914 was published, and a report on accidents at ore-dressing and smelting plants for the same years was completed.

The compilation of accident statistics is being conducted under the direction of A. H. Fay, mining engineer.

EXAMINATION OF MINING LAWS.

The law examiner continued to collect and examine mining laws and to compile digests of court decisions interpreting these laws, in an effort to indicate to the mining industry or to State legislatures what laws are proving most effective in aiding the development of the mining industry and in the introduction of safer and more efficient methods in mining.

A large report issued in two volumes as a bulletin contains a complete compilation and annotation of all the sections of the United States Revised Statutes and of all acts of Congress relating to mines, mining, mineral lands, and the mineral industry on public lands. The annotation consists of abstracts of court decisions that indicate how the courts have pointed out defects in the statutes, made clear uncertainties, and aided practical application. The large number and wide range of the decisions show that the value of mining laws depends on their status as established by the courts, and the annotations aid a person in determining how to apply the provisions of an act to a mining enterprise.

Two other bulletins containing abstracts of current decisions on mines and mining, covering the periods from December, 1913, to September, 1914, and from October, 1914, to May, 1915, were published during the year.

The law examiner has made considerable progress in preparing a compilation and annotation of State mining laws, a work planned on the same lines as that on the Federal statutes. This work involves the examination of the statutes of all mining States, as well as a careful search in the reports and a study of the decisions in regard to mines and mining rights, and the construction of the State statutes bearing on these subjects.

The work is in charge of J. W. Thompson, law examiner, assisted by U. B. White, law clerk.

EXPERIMENTAL-MINE AND ALLIED INVESTIGATIONS.

The workings of the bureau's small experimental mine near Bruceton, Pa., were extended by lengthening the butt entries and starting two rooms. The entries at the end of the year had a combined total length of about 3,800 feet. During the 7½ months given to experimenting, 92 explosion tests were made, a little less than one test for each two working days. About three months' time in the summer of 1914 was spent in repair work, in building new instrument stations, and in lining with concrete the inner 350 feet of the main entries. No testing was done during the last 1⅓ months of the fiscal year 1915, as the technical force was employed in plotting the records of the explosion tests in preparation for a report describing the work of the two preceding years.

The more important results of the year's work may be summarized as follows:

The relative inflammability of the coal dust from coals in five districts, and representing as many types of coal, was determined as a result of 9 to 12 tests. The inflammability of the coals tested increased in the order indicated below, and the degree of inflammability varied, though not directly, with the ratio of volatile combustible to total combustible. The first coal dust on the list was tested the previous fiscal year and found nonexplosive, the second was nonexplosive without the presence of gas, but was explosive in conjunction with 1 per cent or more of fire damp. The list follows:

Wyoming Valley coal—Low-volatile anthracite.
Lykens (special) coal—Higher-volatile anthracite.
Beckley coal—Low-volatile bituminous or semibituminous.
Lower Kittanning coal—Bituminous, but not a true coking coal.
Upper Freeport coal—Bituminous, but not a true coking coal.
Pittsburgh coal—Bituminous, high-volatile gas and coking coal.

In addition to inflammability tests the quantity of incombustible material that, if added to the coal dust, would render the mixture noninflammable was determined for the five coals under two test conditions: First, when the zone of pure or mixed dust under test was placed up to the black-powder shot at the face; second, when a 50-foot zone of a pure Pittsburgh coal dust separated the shot from the dust under test to give the effect of a pocket of gas ignited by a blown-out shot. Manifestly, more shale dust was necessary to give the desired protection under the latter test condition than under the former, and the amount of shale dust necessary varied directly with the inflammability of the dust tested. The tests were conducted in the concrete-lined part of the mine to prevent any dust from the roof, ribs, or ballast from entering into the explosion. From the results of the tests recommendations were made to individual operators which, if carried out in the mines working the seams represented, will reduce to a minimum the possibility of a widespread explosion. It is planned to test dusts from other typical coals, including lignites from various parts of the country.

In a large number of tests small percentages of natural gas (less than 1 to more than 3 per cent) were turned into the air current. The presence of this gas increased the explosibility of the coal dust proportionately to the percentage of gas in the air. The gas caused explosions in mixtures of shale and coal dusts, or in coal dusts of low

inflammability, that without the gas would not have supported explosions; also, as a consequence, more shale-dust protection against explosions was required when there was gas in the air current. The amount of additional shale-dust protection required for the different coals for different percentages of gas in the air was determined.

INFLAMMABILITY TESTS.

In connection with these tests rock-dust barriers for stopping explosions were tested. Several of the barriers designed during the preceding year were modified to make them more effective in stopping explosions. Also a new type of barrier was designed, which proved successful in many tests.

In the mine the butt entries were lengthened, two additional rooms started, four additional concrete instrument stations constructed, new instrument cables were laid through pipes in the rib protected by concrete, and the inner 350 feet of the main entries was lined with concrete by means of a concrete gun, to facilitate the cleaning of the mine after explosions and to assure greater accuracy in the results of tests. At the end of the year the experimental mine had explosion passageways about 3,800 feet long and four rooms of an average length of 103 feet each.

A new recording pressure manometer, a new gas-sampling apparatus, an instrument for detecting the direction of air movements, an improved device for registering the velocity of the explosion gases, and new devices for registering the passage of flame were perfected during the year. For demonstration and educational purposes at field meets throughout the country, wooden coal-dust explosion galleries were designed, to be erected temporarily at small cost wherever the mine-rescue meets are held, to demonstrate the explosibility of coal dust.

TEST OF ROCK DUST IN A COMMERCIAL MINE.

The engineers of the experimental mine, in cooperation with the Pittsburgh Coal Co., began a test to determine the efficiency and cost of rendering coal dust inert by rock dust in a commercial mine. About 2,000 feet of entry in such a mine was dusted with limestone dust during January, 1915, and was inspected every two weeks by one of the bureau's engineers to determine to what extent the rock dust had been contaminated by coal dust and to arrange for further rock dusting if necessary. The results so far seem to indicate that unless much coal is spilled along roadways the method will give better protection against a coal-dust explosion, and, under the conditions tried, might be cheaper than the use of water on a large scale.

REPORTS ON DUST EXPLOSIONS.

Publications of the bureau during the year included a technical paper on "Methods of Preventing and Limiting Explosions in Coal Mines," that discussed methods of treating coal dust so as to keep it from spreading an explosion, and described in detail the rock-dust barriers designed and tested at the experimental mine, prepared by G. S. Rice and L. M. Jones; a miners' circular, outlining what a miner can do to prevent explosions of gas and of coal dust, by G. S. Rice, was also published.

FURTHER TESTS WITH ROCK DUST.

During the coming year it is proposed to make inflammability tests of other coals, particularly those in which the ratio of volatile matter to total combustible is different from that in those already tested, in order to determine whether the inflammability of such coals varies with the ratio mentioned. The tests will be made without any gas in the air current and successively with proportions of 1 to 3 per cent. The efficiency of the rock-dust barriers under various conditions resulting from explosions of different intensities will also be tested, as will the effect of wide places in the starting of an explosion.

Mixtures of coal dust with various percentages of water will be made in order to determine how much water is necessary to prevent the starting and extension of coal-dust explosions through wetted dust zones. To obtain the most severe conditions the tests will be made during cold weather.

Plans for the coming year embrace tests with rock dust in a number of mines, in order to determine under operating conditions the efficiency and cost of rock dusting. Coal companies in different parts of the country have expressed a willingness to cooperate with the bureau in such tests.

RESCUE AND FIRST-AID INVESTIGATION AND TRAINING WORK.

The engineers, foreman miners, and first-aid miners of the mine-rescue cars and rescue stations were engaged chiefly in investigating the causes of mine accidents, in rendering aid at mine disasters, in training miners in the use of first-aid and rescue equipment, in rendering assistance at mine disasters, and in giving first aid to the injured.

During the relatively short period during which the crews of the bureau's cars and stations were able to conduct active training, 60,124 miners visited the cars and stations, 53,612 attended lectures and safety demonstrations, 2,401 received mine-rescue training, and 6,176 were given first-aid instruction.

Details of the instruction, training, and demonstrations in safety methods given from the mine-rescue cars and stations of the bureau are shown in the following tables:

Report of training by mine-rescue cars and stations, July 1, 1914, to June 30, 1915.

Car or station.	Visitors.	At lectures.	Given training.		Certificates issued.		
			Rescue.	First aid.	Rescue.	Combination.	First aid.
Pittsburgh, Pa	1,946	1,355	80	168	7	66	112
Urbana, Ill	.....	.....	7	7	.....	7	.....
Knoxville, Tenn	1,876	1,866	97	385	24	56	210
McAlester, Okla	688	600	32	152	.....	2	.....
Seattle, Wash	1,969	634	146	160	2	51	32
Birmingham, Ala	5,800	701	152	440	18	50	273
Car 1	716	15,550	85	.....	17	.....	.....
Car 2	8,609	2,736	315	1,035	65	198	525
Car 3	3,030	1,557	106	239	.....	17	57
Car 4	5,742	10,130	309	1,099	7	220	470
Car 5	13,358	8,770	254	1,362	14	121	709
Car 6	2,833	585	167	200	.....	167	33
Car 7	2,489	400	171	376	28	79	170
Car 8	11,068	8,728	480	563	5	322	82
Total	60,124	53,612	[a]2,401	[a]6,176	187	1,366	2,706

[a] Includes persons both partly and completely trained.

Report of training by mine-rescue cars and stations, by months, July 1, 1914, to June 30, 1915, based on certificates issued.

Month.	Kind of certificate.			Total.
	Combination.	Mine rescue.	First aid.	
1914.				
July	60	.....	64	124
August	63	18	152	233
September	108	8	149	265
October	162	20	156	338
November	107	12	104	223
December	169	23	192	384
1915.				
January	203	19	389	611
February	143	24	318	465
March	104	18	221	343
April	151	27	473	651
May	60	16	416	492
June	36	2	71	109
Total	1,366	187	2,705	4,258

TESTS OF RESCUE APPARATUS.

During the year 119 tests of breathing apparatus were made and some miscellaneous tests of inhalation devices and fumigating devices. In the conduct of these tests, 530 air samples were taken; also, 4 air samples were taken in a test of the lungmotor.

During the year 389 tests of safety lamps were made, in which 121 gas samples were taken. Twenty-nine trials were made of a new testing gallery, in which 123 gas samples were taken. A number of experiments and trials were made with portable lamp-testing boxes, in which 74 gas samples were taken.

During the year 83 demonstrations were given, including safety-lamp testing, breathing apparatus, and first aid.

ACTIVITIES RELATING TO MINE RESCUE AND FIRST-AID WORK.

Miscellaneous work during the year was as follows:

Schedule 7, "Procedure for Establishing a List of Permissible Miners' Safety Lamps," was drafted for approval by the Secretary of the Interior.

Rescue maneuvers at Terre Haute, Ind., were conducted.

The lungmotor, a mechanical device for resuscitating persons, was investigated and a spirometer was designed.

A new type of oxygen resuscitator was designed.

The manuscript of a miners' circular, entitled "Notes on Miners' Carbide Lamps," was transmitted for publication.

A report on oxygen rescue apparatus; tests and observations, was completed.

A half-hour breathing apparatus was tested for the Navy Department.

RESCUE AND RECOVERY WORK AFTER MINE EXPLOSIONS AND FIRES.

Systematic methods of rescue and recovery work after mine disasters are being improved year by year. The increased efficiency of these methods is due in some measure to the work of men trained

by the Bureau of Mines. During the past fiscal year representatives of the bureau attended and investigated 77 accidents throughout the country, and in 22 instances the bureau's men wore breathing apparatus in rescue and recovery work.

On March 6, 1915, under the direction of the State mine inspectors of West Virginia, a rescue crew of the Bureau of Mines assisted a volunteer crew of the United States Coal & Coke Co. from Gary, W. Va., and local miners and officials of the New River & Pocahontas Consolidated Coal & Coke Co., in the rescue of 42 men imprisoned by an explosion at the Layland mine in West Virginia, on March 2. The work by the crew from Gary deserves the highest praise. On receiving news of the explosion the general superintendent, Edward O'Toole, at once sent the crew to Layland, 275 miles distant. The crew, consisting of 11 men, was in charge of the chief chemist of the United States Coal & Coke Co., Vitus Klier, and carried its own breathing apparatus and supplies.

There were two fatalities during the fiscal year among trained men wearing breathing apparatus. March 2, 1915, at Black Hawk, Utah, Grant S. Miller, a member of the Black Hawk Coal Co.'s rescue crew, was overcome while fighting a mine fire, and died in spite of courageous efforts of his comrades to save his life. May 24, 1915, at Johnstown, Pa., Gomer Phillips, captain of the Cambria Steel Co.'s apparatus crew, died while leading his crew in recovery work after an explosion in the Smokeless No. 1 mine.

During the past four years three rescue men of the Bureau of Mines, Joseph Evans, John Ferrell, and Edward Evans, have lost their lives while wearing breathing apparatus.

The bureau's engineers investigated the causes leading to the deaths of Grant S. Miller and Gomer Phillips, and the facts obtained emphasized the extreme care necessary in the use of all types of breathing apparatus.

Following are summarized accounts of 21 accidents in which lives were saved:

JULY 21, 1914, POWDER SMOKE IN BANOVICH SILVER MINE, NEAR TONOPAH, NEV.

Two men overcome by powder smoke at the bottom of a 95-foot shaft were brought out by two Bureau of Mines men from car 5. The rescuers descended the shaft, tied ropes under the armpits of the unconscious miners, and had them hoisted to the surface, where oxygen and artificial respiration were used for two hours. One miner fully recovered, but no sign of life appeared in the other miner.

AUGUST 1, 1914, FIRE IN MILBY DOW MINE, DOW, OKLA.

Following the fire, the top of the 40-foot shaft had been sealed for 30 days. A Bureau of Mines crew from McAlester, Okla., assisted by three company men, opened the fire area after six days' work, while wearing breathing apparatus. On the third exploration one apparatus man was overcome at the bottom of the slope, and the Bureau of Mines crew conveyed him to the shaft bottom (1,000 feet), where all were hoisted to the top in safety. This man's life was probably saved by the crew captain adjusting the breathing apparatus so as to supply more oxygen.

SEPTEMBER 1, 1914, EXPLOSION IN ROCKWOOD MINE, ROCKWOOD, TENN.

The explosion killed one miner, and another miner was overcome while trying to escape. An apparatus crew of four company men several hours later advanced 1,000 feet, rescued this miner, and carried him to fresh air, where he quickly revived.

SEPTEMBER 17, 1914, CAVE-IN AT CENTENNIAL GOLD MINE, EUREKA, UTAH.

Twelve men were imprisoned. One man was rescued by company men, who, in seven hours, drove drift 15 feet in country rock without shooting.

OCTOBER 5, 1914, EXPLOSION IN MULGA MINE, MULGA, ALA.

Sixteen men were killed and 12 were rescued by parties led by company officials.

OCTOBER 25, 1914, EXPLOSION AT PATTERSON NO. 2 MINE, ELIZABETH, PA.

Following the explosion the superintendent and the pump man were overcome by afterdamp. A rescue party in charge of the mine foreman carried the unconscious men to fresh air. The superintendent soon recovered, but the pump man could not be revived. Breathing apparatus was not used.

OCTOBER 27, 1914, EXPLOSION AT ROYALTON MINE, ROYALTON, ILL.

Fifty men were killed; one miner was rescued by the Illinois State crew from the Benton rescue station.

NOVEMBER 8, 1914, FALL OF TOP ROCK AT WEST BROOKSIDE MINE, POTTSVILLE, PA.

Two men were imprisoned for four days, when they were rescued by a party led by company officials.

NOVEMBER 9, 1914, CAVE-IN AT SIBLEY IRON MINE, ELY, MINN.

Six men were entombed. One man was rescued after 112 hours by parties in charge of company officials.

NOVEMBER 28, 1914, POWDER SMOKE IN BONAR MINE, EAST BERNSTADT, KY.

Three men were overcome. They were rescued by the State mine inspector and the mine superintendent. One miner was revived by artificial respiration; the other two died.

JANUARY 4, 1914, CAVE-IN AT BLACK DIAMOND MINE, LUZERNE, PA.

Four miners were rescued after seven hours by parties in charge of company officials.

FEBRUARY 6, 1915, EXPLOSION AT CARLISLE MINE, CARLISLE, W. VA.

Twenty men were killed and four were rescued by parties in charge of company officials.

FEBRUARY 17, 1915, EXPLOSION AT PROSPECT MINE, WILKES-BARRE, PA.

Eight men were killed. Six others were burned, but were rescued by parties in charge of company officials.

FEBRUARY 26, 1915, EXPLOSION AT NO. 18 WESTERN MINE, FRANKLIN, KANS.

A shot firer was badly burned, but was rescued by a party in charge of the mine superintendent.

MARCH 2, 1915, FIRE AT BLACK HAWK MINE, BLACK HAWK, UTAH.

The Bureau of Mines crew from car 2 and 28 company men worked with breathing apparatus for a total of 40 days and extinguished the fire after a hazardous fight. Grant S. Miller lost his life while wearing the apparatus during an exploration 1,120 feet from fresh air on March 2, and two other men were overcome. One of these was rescued and carried to the drift mouth by Bureau of Mines men, and the other man was rescued by apparatus men of the company.

MARCH 2, 1915, EXPLOSION IN LAYLAND NO. 3 MINE, LAYLAND, W. VA.

The explosion occurred on the morning of March 2, resulting in the loss of 115 lives. On the morning of March 6, 42 miners were discovered behind barricades in the tenth left entry 7,000 feet from the drift mouth, having been imprisoned for four days. They were rescued by the Gary (W. Va.) apparatus men, Bureau of Mines apparatus men, the State mine inspectors, company officials, and volunteer rescuers from other mines.

MARCH 4, 1915, FIRE IN SPRING CREEK MINE, SPRINGFIELD, ILL.

The fire was extinguished by apparatus crews from the Springfield rescue station. Three men were overcome by the fumes, but were carried to safety by the Springfield apparatus men.

MARCH 17, 1915, EXPLOSION AT CITIZENS' "B" MINE, SPRINGFIELD, ILL.

Two shot firers were burned and overcome by afterdamp. They were rescued by a party in charge of the mine manager; however, both men died the following day.

APRIL 5, 1915, EXPLOSION AT SHOAL CREEK NO. 1 MINE, PANAMA, ILL.

Eleven miners were killed, but two were rescued alive 15 minutes after the explosion by parties in charge of the company officials.

MAY 24, 1915, EXPLOSION AT SMOKELESS NO. 1 MINE, JOHNSTOWN, PA.

Eight men were killed. In apparatus exploration that followed Gomer Phillips, rescue foreman of the Cambria Steel Co., lost his life. Another apparatus man was overcome, but was rescued by State mine inspectors, company officials, and Cambria Steel Co. officials, who accomplished some rapid brattice work and made a courageous rescue.

JUNE 10, 1915, RUSH OF MUD AND WATER INTO LONGACRE-CHAPMAN ZINC MINE, NECK CITY, MO.

Six men were imprisoned. Four were rescued alive after 120 hours of difficult work by company men, volunteers, State mine inspectors, and Bureau of Mines men. Two men found were dead on the fourteenth day following the accident.

ACCIDENTS INVESTIGATED DURING THE YEAR.

As shown by the following table, in the 77 accidents investigated by bureau employees there were 363 men killed, 1,177 escaped unassisted, and 107 were rescued through the efforts of volunteer miners, company officials, State mine inspectors, company rescue crews, State of Illinois rescue crews, and Bureau of Mines rescue crews.

Mining and other accidents investigated during fiscal year 1915, showing number of men killed, injured, suffocated, rescued, etc.

Name of mine.	Location.	Date.	Number killed.	Number injured.	Number suffocated.	Rescued by Bureau of Mines men.	Rescued by others.	Rescued jointly by Bureau of Mines men and others.	Escaped unassisted.	Number wearing breathing apparatus.	Days wearing breathing apparatus.	Died wearing apparatus.	Nature of accident.	Investigated by—
		1914.												
Rock Island No. 8	Hartshorne, Okla.	July 2	1	0	1				1				Explosion	J. J. Rutledge, J. W. Koster, W. T. Burgess.
Balkan (iron)	Alpha, Mich	July 14	7	0					5				Flood	Edwin Higgins.
Rock Island No. 8	Hartshorne, Okla.	July 16	1	0					1				Explosion	J. J. Rutledge, J. W. Koster, W. T. Burgess.
Davis (iron) [a]	Ironwood, Mich.	July 18	0	0						5	2		Fire	W. W. Sullivan (car 8)
Vandalia No. 82	Terre Haute, Ind.	...do...	0	1									Carbide accident	H. I. Smith.
Banovich (silver) [a]	Tonopah, Nev.	July 21	1	1	1	1			1	2	½		Powder smoke in shaft	Edw. Steidle, G. W. Riggs.
City sewer [a]	Pittsburgh, Pa.	July 28	0	1					1	4	½		Explosion in sewer	G. S. Rice, G. A. Burrell, H. D. Mason, jr., R. H. Seip, J. H. East, G. E. McElroy.
Milby Dow [a]	Dow, Okla.	Aug. 1	0	1		1				8	6		Fire	J. J. Rutledge, W. J. German, A. I. Young, J. W. Koster, Thos. Fairley.
Babylon shaft	Duryea, Pa.	Aug. 12	2	0					1				Fall of top	Charles Enzian.
Big Blue (gold)	Kernville, Cal.	Aug. 14	3	1									Fire	H. M. Wolflin.
Kaylor No. 2 (limestone)	Kaylor, Pa.	Aug. 19	2	0									Bolt of lightning	G. E. McElroy.
West Frankfort No. 1	West Frankfort, Ill.	Aug. 23	2	0									Explosion	H. I. Smith.
Rockwood [a]	Rockwood, Tenn.	Sept. 1	1	1					4	4	½		...do	J. M. Webb.
Adamson No. 1	Adamson, Okla.	Sept. 3	13	0						4	½		Cave-in	J. J. Rutledge, J. W. Koster, J. R. Fleming, W. T. Burgess.
Hiawatha (iron) [a]	Stambaugh, Mich.	Sept. 8	0	0					2	12	3		Fire	W. W. Sullivan, J. H. East, Edw. Higgins (car 8).
West Clinton	Jacksonville, Ind.	Sept. 12	0	1					1				Explosion	H. I. Smith.
Gratz (lead) [a]	Lockport, Ky.	Sept. 16	2	0						6	½		Fire	G. T. Powell, W. J. German, R. H. Seip, J. H. East, H. D. Jones, W. W. Sullivan (car 3).
Lansford shaft No. 4	Lansford, Pa.	...do...	7	2									Explosion	Jesse Henson.
Eureka Centennial (gold). [a]	Eureka, Utah.	Sept. 17	11	0			1		1				Cave-in	J. C. Roberts, J. T. More.

[a] Apparatus was used.

Mining and other accidents investigated during fiscal year 1915, showing number of men killed, injured, suffocated, rescued, etc.—Continued.

Name of mine.	Location.	Date.	Number killed.	Number injured.	Number suffocated.	Rescued by Bureau of Mines men.	Rescued by others.	Rescued jointly by Bureau of Mines men and others.	Escaped unassisted.	Number wearing breathing apparatus.	Days wearing breathing apparatus.	Died wearing apparatus.	Nature of accident.	Investigated by—
		1914.												
Superior No. 1[a]	Russellton, Pa.	Sept. 18	0	2	.....	.....	.....	.....	21	4	1	.....	Fire and explosion	H. D. Mason, jr., W. A. Raudenbush, E. B. Sutton, G. E. McElroy (auto truck).
Slatestone	Briceville, Tenn.	Sept. 21	0	1	.....	.....	.....	.....	.....	.....	.....	.....	do	E. B. Sutton.
Indian Creek	Bicknell, Ind.	do	2	3	1	.....	.....	.....	295	.....	.....	.....	do	G. T. Powell, W. J. German.
Davy-American (zinc)	Webb City, Mo.	Oct. 1	0	0	.....	.....	.....	.....	50	.....	.....	.....	Cave-in	Edwin Higgins.
Majestic	Duquoin, Ill.	do	1	0	.....	.....	.....	.....	.....	.....	.....	.....	Powder explosion	H. I. Smith.
Mulga[a]	Mulga, Ala.	Oct. 5	16	16	16	.....	12	.....	251	5	½	.....	Explosion	E. B. Sutton (auto truck).
Smuggler (silver)[a]	Aspen, Colo.	do	0	1	.....	.....	.....	.....	48	8	1	.....	Fire	J. C. Roberts, John Boardman, J. T. More (car 2).
Pocahontas No. 1[a]	Pocahontas, Okla.	Oct. 16	0	0	.....	.....	.....	.....	.....	12	1	.....	do	J. W. Koster.
Baker Quarry (limestone).	Bluefield, W. Va.	Oct. 19	6	1	.....	.....	.....	.....	2	.....	.....	.....	Cave-in	H. D. Mason, jr., D. Harrington.
Patterson No. 2[a]	Elizabeth, Pa.	Oct. 26	1	1	1	.....	1	.....	.....	4	½	.....	Explosion	L. M. Jones, H. D. Mason, jr., W. J. German, D. J. Price, W. A. Raudenbush (auto truck).
Royalton[a]	Royalton, Ill.	Oct. 27	52	3	20	.....	1	.....	293	16	1	.....	do	J. W. Paul, H. I. Smith, G. T. Powell (car 3).
Coleanor[a]	Coleanor, Ala.	Oct. 31	3	2	2	.....	.....	.....	3	4	½	.....	do	E. B. Sutton (auto truck).
West Brookside	Pottsville, Pa.	Nov. 8	0	0	.....	.....	2	.....	.....	.....	.....	.....	Fall of coal	Charles Enzian.
Sibley (iron)	Ely, Minn.	Nov. 9	5	0	.....	.....	1	.....	.....	.....	.....	.....	Cave-in	W. W. Sullivan.
Saline No. 6	Eldorado, Ill.	Nov. 11	0	0	.....	.....	.....	.....	.....	.....	.....	.....	Fire	H. I. Smith.
West Clinton	Jacksonville, Ind.	Nov. 15	0	3	.....	.....	.....	.....	.....	.....	.....	.....	Explosion	Do.
Central No. 48[a]	Ringo Junction, Kans.	Nov. 23	1	0	.....	.....	.....	.....	[b]1	4	½	.....	do	K. H. Chisholm.
Bonar	East Bernstadt, Ky.	Nov. 28	2	1	2	.....	2	.....	.....	.....	.....	.....	Powder smoke	H. D. Mason, jr.
Tripp shaft	Scranton, Pa.	Dec. 9	12	1	.....	.....	1	.....	.....	.....	.....	.....	Cage accident	Charles Enzian, D. Harrington.
West Clinton	Jacksonville, Ind.	Dec. 10	0	2	.....	.....	.....	.....	.....	.....	.....	.....	Explosion	H. I. Smith.
Vandalia No. 82	Terre Haute, Ind.	Dec. 15	1	1	.....	.....	.....	.....	.....	.....	.....	.....	do	Do.
Spencer-Newland No. 7[a]	Mulberry, Kans.	Dec. 18	2	0	2	.....	.....	.....	.....	4	½	.....	do	Do.
Western No. 18[a]	Franklin, Kans.	Dec. 28	1	0	.....	.....	.....	.....	1	6	½	.....	do	K. H. Chisholm.
		1915.												
Black Diamond	Luzerne, Pa.	Jan. 4	0	0	.....	.....	4	.....	.....	.....	.....	.....	do	Jesse Henson.
McCormack No. 7	Arma, Kans.	Jan. 11	0	0	.....	.....	.....	.....	.....	.....	.....	.....	Explosion	J. W. Koster.

Jackson Hill No. 2	Hymera, Ind	Jan. 15	0	2				2				do	H. I. Smith.
Pocahontas No. 1	Pocahontas, Okla	Jan. 16	1	0				1				do	J. J. Rutledge, J. W. Koster, D. Harrington.
Maple Grove No. 4	New Goshen, Ind	Jan. 20	2	0								do	H. I. Smith, J. R. Fleming.
Tremont	Arnold City, Pa	Jan. 22	0	0								Fire	L. M. Jones.
Carbon No. 3	Carbon, Okla	Jan. 23	1	0				1				Explosion	J. J. Rutledge, J. W. Koster.
Delaney No. 5	Coupon, Pa	Jan. 28	2	4				4				Haulage accident	H. D. Mason, jr.
West Liberty	Pittsburgh, Pa	Feb. 4	0	0								Fire	L. M. Jones.
Carlisle	Carlisle, W. Va	Feb. 6	21	3	14		4	150				Explosion	D. J. Parker, W. A. Lynott, R. H. Seip, Edw. Staley, H. D. Jones (car 8).
Gagnon (copper)	Butte, Mont	Feb. 8	4	1								Cave in shaft	J. C. Roberts.
Collier Cooperative	Bartonville, Ill	Feb. 9	2	0	2							Explosion	H. I. Smith, G. T. Powell.
Maple Grove	Terre Haute, Ind	Feb. 10	1	0								Cave in shaft	Do.
Bessemer No. 1	Russellton, Pa	Feb. 12	1	1								Explosives	W. J. German.
Central No. 47	Pittsburg, Kans	do	2	0				2				Explosion	W. W. Fleming.
Buckhorn	Waverly, Mo	Feb. 14	2	1			1	1				do	D. Harrington.
Prospect [a]	Wilkes-Barre, Pa	Feb. 17	13	3	10		7		8	½		do	Chas. Enzian, Jesse Henson.
Atlas No. 2	Rich Hill, Mo	Feb. 18	5	0								do	D. Harrington.
Alpha Cement Mill	Martins Creek, Pa	Feb. 20	1	7								Coal-dust explosion	Chas. Enzian.
Jackson Hill No. 2	Hymera, Ind	Feb. 26	2	0								Explosion	H. I. Smith.
Western No. 18	Franklin, Kans	do	0	1			1	1				do	W. W. Fleming.
Crown Hill No. 3	Clinton, Ind	Feb. 27	1	0								do	H. I. Smith.
Maplewood No. 2	Farmington, Ill	Mar. 1	0	1								Carbide accident	Do.
McCormack No. 7	Arma, Kans	Mar. 2	0	0								Explosion	J. W. Koster.
Black Hawk [a]	Black Hawk, Utah	do	1	3	1	1	1		30	40	1	Fire	G. W. Riggs, C. A. Arthur, J. C. Roberts (car 2).
Layland No. 3 [a]	Layland, W. Va	do	114	1	41		7	42	5	18	6	Explosion	J. W. Paul, G. S. Rice, H. D. Mason, jr., W. J. German, D. J. Parker, H. D. Jones, R. H. Seip, W. A. Lynott, Edw. Staley (car 8).
Spring Creek [a]	Springfield, Ill	Mar. 4	0	5			5			8	½	Fire	H. I. Smith.
Dwelling House [a]	McKeesport, Pa	Mar. 16	1	0						1	½	1 Accident with fireman's smoke helmet	H. D. Mason, jr.
Citizens "B"	Springfield, Ill	Mar. 17	2	0			2		4			Explosion	J. R. Fleming.
Shoal Creek No. 1 [a]	Panama, Ill	Apr. 5	11	2	8		2			6	½	do	H. I. Smith, G. T. Powell (car 3).
Viola	Carlisle, Ind	Apr. 9, 13	1	1	1							do	J. R. Fleming.
Inman No. 2	Appalachia, Va	Apr. 16	0	0								Fire	E. B. Sutton.
Davy-Pocahontas No. 1 [a]	Roderfield, W. Va	Apr. 17	3	0					3	4	½	Explosion	D. J. Parker, H. D. Mason, jr., W. A. Lynott, H. D. Jones, R. H. Seip (car 8).
Smokeless No. 1 [a]	Johnstown, Pa	May 24	9	1	6		2		18	8	½	1 do	H. D. Mason, jr., W. J. German, L. M. Jones, D. Harrington.
Longacre (zinc)	Neck City, Mo	June 10	2	1			5		2			Rush of mud and water	J. W. Paul, J. J. Rutledge, A. I. Young, J. J. V. Forbes (car 4).
Total			363	85	149	3	62	42	1,177	195	67½	3	

[a] Apparatus was used.

[b] Shot firer escaped by using "self-rescue oxygen apparatus."

Of the 77 accidents investigated 60 were in coal mines, 12 in metal mines, 1 in a limestone mine, and 1 in a limestone quarry. One was an explosion in the city sewer in Pittsburgh, Pa., 1 a coal-dust explosion in a cement mill, and 1 an accident to a fireman wearing a smoke helmet in a fire in a dwelling in McKeesport, Pa.

The accidents are classified as follows:

Explosion, 42; fire, 13; explosion and fire, 1; cave-in, 8; powder smoke, 2; bolt of lightning, 1; fall of top, 2; carbide accident, 2; flood, 2; sewer explosion, 1; haulage accident, 1; cage accident, 1; accident with smoke helmet, 1; total, 77.

ACCIDENTS INVESTIGATED SINCE 1907.

The following table shows the number of accidents investigated during each calendar year since Government investigations of mine accidents began in 1907:

Accidents investigated by Bureau of Mines employees, and number of persons killed, suffocated, and rescued, 1907–1915.

Item.	1907	1908	1909	1910	1911	1912	1913	1914	1915 to June 30.	Total.
Number of accidents investigated	12	16	25	25	35	47	73	65	35	333
Number killed	837	331	494	522	462	283	512	377	207	4,025
Number suffocated	269	114	80	200	201	51	122	63	83	1,183
Number rescued by Bureau of Mines men	.....	2	29	20	13	7	19	2	[a] 43	135
Number rescued by others	21	16	124	243	81	84	106	26	41	742
Number who escaped unassisted	5	33	403	132	18	117	100	1,127	194	2,098

[a] Includes 42 miners at Layland, W. Va., rescued jointly by Bureau of Mines crew, Gary (W. Va.) crew, State inspectors, company officials, and volunteer crews.

The accidents investigated were in 18 States as follows: Alabama, 1; California, 1; Colorado, 1; Illinois, 9; Indiana, 12; Kansas, 7; Kentucky, 2; Michigan, 3; Minnesota, 1; Missouri, 4; Montana, 1; Nevada, 1; Oklahoma, 7; Pennsylvania, 17; Tennessee, 2; Utah, 2; Virginia, 2; West Virginia, 2.

A tabulation showing accidents investigated, classified by States, follows:

Number of disasters investigated, by States, 1907–1915.

State.	1907	1908	1909	1910	1911	1912	1913	1914	1915[a]	Total.
Alabama	1	.....	1	3	1	2	2	3	.....	13
Arizona	.....	.....	.....	.....	.....	.....	1	.....	.....	1
Arkansas	.....	.....	.....	.....	.....	.....	2	.....	.....	2
California	.....	.....	.....	.....	.....	.....	1	1	.....	2
Colorado	1	.....	.....	5	4	6	4	2	.....	22
Idaho	.....	.....	.....	.....	1	2	1	.....	.....	4
Illinois	2	4	7	2	.....	2	1	4	5	27
Indiana	.....	.....	2	1	1	2	9	7	6	28
Iowa	.....	.....	.....	.....	.....	.....	.....	1	.....	1
Kansas	.....	.....	.....	.....	1	4	4	10	4	23
Kentucky	.....	.....	1	4	1	3	5	2	.....	16
Michigan	.....	.....	.....	.....	2	1	4	4	.....	11
Minnesota	.....	.....	.....	.....	.....	.....	1	1	.....	2
Missouri	.....	.....	.....	.....	1	.....	.....	2	3	6
Montana	.....	.....	.....	.....	1	.....	.....	1	1	3
Nevada	.....	.....	.....	.....	2	.....	.....	1	.....	3
New Mexico	1	.....	.....	.....	.....	.....	1	.....	.....	2
Ohio	.....	.....	1	1	1	1	4	1	.....	9
Oklahoma	.....	2	3	4	5	9	5	7	2	37
Pennsylvania	2	6	6	2	6	10	24	10	9	75
Tennessee	.....	.....	1	.....	1	.....	1	2	.....	5
Utah	.....	.....	.....	.....	.....	.....	.....	1	1	2
Virginia	.....	.....	.....	1	1	1	.....	.....	1	4
Washington	.....	.....	1	2	2	.....	1	.....	.....	6
West Virginia	5	3	2	.....	4	3	2	5	3	27
Wyoming	.....	1	.....	.....	.....	1	.....	.....	.....	2

[a] Up to June 30.

PERSONNEL OF RESCUE CARS AND STATIONS.

J. W. Paul, mining engineer, who has his headquarters at the Pittsburgh station, is in charge of mine-rescue operations and of the testing of all mine-rescue apparatus and mine-safety lamps. He is assisted by H. D. Mason, jr., assistant mining engineer, and G. E. McElroy, junior mining engineer, who conducts the lamp tests at the Pittsburgh station.

As stated on page 627, the country is divided into 10 districts, work in each of which is in charge of an engineer.

Anthracite district.—The anthracite district of eastern Pennsylvania, which embraces the field of mine-rescue car 1, is in charge of Charles Enzian, mining engineer, with headquarters at Wilkes-Barre, Pa.

Rescue car 1, which has its headquarters at Kingston, Pa., is in charge of Jesse Henson, foreman miner. During the fiscal year A. A. Flynn and C. O. Roberts, foreman miners, served with the car for short periods.

Pittsburgh district.—The bituminous district of western Pennsylvania, Ohio, northern West Virginia, and Maryland is under the supervision of J. W. Paul, with headquarters at Pittsburgh, Pa., assisted by H. D. Mason, jr. W. J. German, foreman miner, is foreman of the Pittsburgh station and of automobile rescue truck No. 2. W. A. Raudenbush also served as foreman at this station. During the fiscal year C. O. Roberts, foreman miner; W. A. Raudenbush, foreman miner; H. D. Jones, foreman miner; and G. W. Grove, first-aid miner, served for various periods on rescue car 6, which has its headquarters at Pittsburgh.

Southern district.—The southern district, including Tennessee, Georgia, and Alabama, is under charge of E. B. Sutton, assistant mining engineer, with headquarters at Birmingham, Ala., embracing the mine-rescue substation at Knoxville, Tenn. Mr. Sutton is assisted at the Birmingham station by W. T. Burgess, who has charge of automobile rescue truck No. 1; J. M. Webb, foreman miner, assists at the Knoxville station.

Truck 1 and truck 2 at Pittsburgh accomplished efficient training work. Both were called to attend mine disasters.

Lake Superior district.—The Lake Superior copper and iron district, including northern Michigan, Wisconsin, and Minnesota, and embracing the field of operation of mine-rescue car 7, is in charge of Edwin Higgins, mining engineer, with headquarters at Ironwood, Mich. During the fiscal year W. W. Sullivan, foreman miner; J. H. East, first-aid miner; and W. W. Fleming, first-aid miner, were attached to car 7 for various periods of service. Car 7 was moved from West Virginia to Michigan in September, 1914, while car 8 was sent from Michigan to West Virginia for special training work in the Pocahontas field.

Southwestern district.—The southwestern district, including the mine-rescue station at McAlester, Okla., the substation at Pittsburg, Kans.; and the field of operation of car 4, is in charge of J. J. Rutledge, mining engineer, with headquarters at McAlester, Okla., assisted by J. W. Koster, junior mining engineer. A. I. Young, foreman miner, is in charge of car 4, with headquarters at Pittsburg, Kans. During the fiscal year W. T. Burgess, foreman miner; J. H.

East, first-aid miner; and J. J. V. Forbes, first-aid miner, were also attached to car 4 for short periods of service.

Central district.—The central district, including Indiana, Illinois, western Kentucky, southern Michigan, Iowa, and northern Missouri, is under the general supervision of H. I. Smith, with headquarters at Urbana, Ill. The district embraces the field of operations of mine-rescue car 3, with headquarters at Evansville, Ind. G. T. Powell, foreman miner, is in charge of this car.

Southeastern district.—The southeastern district, including southern West Virginia, eastern Kentucky, and Virginia, embraces the field of activity of mine-rescue car 8, under the general charge of J. D. Parker, mining engineer, with headquarters at Huntington, W. Va.

In November, 1914, car 8 was detailed for special training work in the Pocahontas field of West Virginia, being the first fully manned car sent out by the bureau. The crew comprised H. D. Mason, jr., assistant mining engineer, in charge of the car; W. A. Lynott, mine surgeon; G. W. Riggs, foreman miner; R. H. Seip, first-aid miner; H. E. Meyer, car clerk; and Elmo Bonds, cook; the general operation of the car being under the direction of J. W. Paul. In addition to a complete course of both rescue and first-aid training being given 480 miners in six months, the best record achieved by any Bureau of Mines rescue car, more than 80 mines were inspected by the engineers in charge, 81 communities were inspected by the mine surgeon, and at each town lectures, illustrated by motion pictures, were given by the car crew. In addition, the car went to three mine disasters, one at Carlisle, W. Va., one at Layland, W. Va., and one at Roderfield, W. Va.

Changes in the personnel of the crew during the year were made as follows: D. J. Parker, mining engineer, took charge of the car on January 1, 1915, and H. D. Jones became foreman miner. Edwin Staley and T. H. Naylor, clerks, were attached to the car for various periods of service.

On June 14, 1915, a successful field meet was held at Huntington, W. Va., by the first-aid and rescue teams previously trained by the car men.

Rocky Mountain district.—The Rocky Mountain district, including the field of operations of car 2 in Colorado, Utah, Arizona, and New Mexico, with headquarters at Denver, Colo., and of mine-rescue car 5 in Montana, Wyoming, Idaho, and Washington, with headquarters at Billings, Mont., was under the supervision of J. C. Roberts, mining engineer, with headquarters at Denver, Colo.

During the fiscal year John Boardman, foreman miner; K. H. Chisholm, foreman miner; J. T. More, foreman miner; C. S. Arthur, first-aid miner; and G. W. Riggs, foreman miner, were attached to car 2 for various periods of service. J. H. East, foreman miner, is now in charge of the car.

John Boardman, foreman miner, was in charge of car 5. During the fiscal year Edward Steidle, junior mining engineer; G. W. Riggs, foreman miner; and G. W. Grove, first-aid miner, were attached to the car for various periods of service.

Northern Pacific district.—The northern Pacific district, which includes the field of operations of the Seattle (Wash.) mine-rescue

station, is in immediate charge of J. J. Corey, foreman miner, and is under the supervision of H. M. Wolflin, mining engineer.

California-Nevada district.—The California-Nevada district, including the temporary rescue station at the Panama-Pacific Exposition, where training work has been in progress since the opening of the exposition, is under the direction of Edward Steidle, assistant mining engineer, and in general charge of H. M. Wolflin, mining engineer, with headquarters at San Francisco, Cal.

FIELD CONTESTS IN MINE-RESCUE AND FIRST-AID METHODS.

Below is a list of the 47 mine-rescue and first-aid contests and field meets held during the past year under the auspices or by the assistance of the Bureau of Mines. A few of these contests were company affairs, but most were intercompany or intrastate. In many contests the Bureau of Mines employees arranged and supervised the events, and in nearly all, at the request of the operators and miners, gave the competing teams special instruction and training.

The holding of these contests at points so widely distributed throughout the United States demonstrates the interest and enthusiasm of miners and mine officials in carrying forward the mine-safety work of the Bureau of Mines.

In a number of instances the mine workers, without assistance from the operators, have successfully conducted such field meets, notably at Eldora Park, Pa., the miners' field day, which has come to be an annual affair.

An illustration of the recent rapid growth of the safety movement in the mines of the Southern States is the field meet at Birmingham, Ala., May 29, 1915, in which 80 mine-rescue and first-aid teams participated.

Chiefly as a result of the work of the bureau there will be held at the Panama-Pacific Exposition, San Francisco, Cal., September 23 and 24, the third annual joint field meet of the Bureau of Mines and the American Mine Safety Association. This is expected to be one of the most important events of its kind ever held.

The places at which mine-rescue and first-aid contests were held during the fiscal year are listed below:

Places at which mine-rescue and first-aid contests were held during the fiscal year 1914–15.

1914.		1914.	
Hiawatha, Utah	July 4	Jellico, Tenn	Sept. 7
Ely, Nev	July 4	Jackson, Cal	Sept. 7
Red Lodge, Mont	July 8	Terre Haute, Ind	Sept. 12
Cuba, Ill	July 18	Valley View Park, Pa	Sept. 19
Seattle, Wash	July 22	Lakeside Park, Pa	Sept. 19
Castle Gate, Utah	July 24	Ellsworth, Pa	Sept. 22
Somerset, Pa	July 25	Springfield, Ill	Sept. 25
Tonopah, Nev	Aug. 9	Price, Utah	Sept. 26
Harveys Lakes, Pa	Aug. 15	Edgewood Park, Pa	Sept. 26
Eldora Park, Pa	Aug. 22	Republic, Pa	Oct. 10
Ishpeming, Mich	Aug. 31	Knoxville, Tenn	Oct. 24
Greensburg, Pa	Sept. 5	Beckley, W. Va	Oct. 27
Reno, Nev	Sept. 7	Phoenix, Ariz	Nov. 13
Globe, Ariz	Sept. 7	Billings, Mont	Nov. 21
Centerville, Iowa	Sept. 7	Gillespie, Ill	Dec. 8

Places at which mine-rescue and first-aid contests were held during the fiscal year 1914–15—Continued.

1915.			1915.		
Rock Springs, Wyo.	Apr.	1	Pittsburg, Kans.	May	29
Canton, Ill.	May	1	California, Pa.	May	29
Ray, Ariz.	May	5	Gary, W. Va.	May	29
Butte, Mont.	May	9	Tracey, Mont.	May	29
Huntington, W. Va.	May	14	Birmingham, Ala.	May	29
Pineville, Ky.	May	14	Des Moines, Iowa.	June	5
Great Falls, Mont.	May	15	Moberly, Mo.	June	7
Fort Smith, Ark.	May	18	Roundup, Mont.	June	19
McAlester, Okla.	May	22			

CONFERENCE ON TESTS OF PERMISSIBLE EXPLOSIVES.

One of the notable events in the course of the bureau's efforts to bring about the introduction and use of safe explosives in coal mines was the holding of a conference between manufacturers of explosives and the bureau's engineers and chemists at which an agreement was reached providing for reasonable limits of variation or "tolerances" in the results of analyses and tests of permissible explosives. If these tolerances are exceeded by a given lot of any permissible explosive it is not permissible. The tolerances established are as follows:

Chemical analysis.—Moisture, 1.5 per cent to 4 per cent where the percentage of the moisture in the explosive is 0 to 10 per cent, and in the same proportion for percentages of moisture greater than 10 per cent.

Other ingredients (or their equivalents) in quantities not exceeding 60 per cent, according to a curve the determining points of which are given below. For ingredients in quantities of 60 per cent or more the tolerance shall be 3 per cent.

Permissible variation in quantity of ingredients.

Quantity of constituent.	Limit of variation percentage of total explosive.
Per cent.	
0	1.0
10	1.5
25	2.0
60	3.0

Products of combustion (determined by Bichel gage test) and volume of poisonous gases from 680 grams of the explosive, including its wrapper, must be less than 158 liters.

Physical tests.—Rate of detonation (the average of three trials with the Mettegang recorder), 15 per cent.

Unit deflective charge (the average of three trials with the ballistic pendulum), 10 per cent.

Weight of wrapper per 100 grams of explosive ingredient, 2 grams (average of four determinations).

Apparent specific gravity of cartridge, by sand, 7.5 per cent (average of four determinations).

Gas and dust gallery 1—no ignition must be obtained in each of one or more trials.

Pendulum friction test—each explosive must pass a test of 10 trials.

PHYSICAL TESTS OF EXPLOSIVES.

In order to ascertain the strength, the quickness of action, and the other properties that determine the suitability of an explosive for

use in different kinds of engineering and mining work, the Bureau of Mines makes physical tests of explosives and blasting supplies at the Pittsburgh experiment station. It also makes such tests in determining whether an explosive is permissible for use in dusty or gaseous coal mines.

During the year 30 explosives were tested to determine their permissibility for use in coal mines; 19 passed the tests and were placed on the permissible list, and 11 failed to pass. One explosive that had been withdrawn by the manufacturer was replaced on the permissible list, and 6 explosives were dropped from the list because the manufacturers no longer desired to manufacture them. On June 30, 1915, there were 134 explosives on the permissible list.

Forty-three field samples, or manufacturers' samples of permissible explosives, as they are supplied to the miners, were collected by the bureau's field men and subjected to such tests as would determine whether they were similar in all respects to the sample that had been placed on the permissible list by the bureau. Practically all of these samples were found to be up to the standard of safety and strength required by the bureau, and such variations as did exist were corrected by the manufacturers, or are still in the process of adjustment.

In determining the character and strength of different explosives 3,364 examinations and tests were made during the year.

The total sum collected for tests of explosives during the year was $3,832, distributed as follows:

For permissibility tests of explosives passing the tests	$2,850
For permissibility tests of explosives failing to pass the tests	825
Suitability tests, relative propulsive and disruptive effects	64
Special experimental tests	93
	3,832

INFORMAL TESTS.

Informal tests to demonstrate the safety features of permissible explosives were made for organizations, as follows: Pennsylvania State Editorial Association, American Institute of Mining Engineers, Senior and Junior Chemists of the Pennsylvania State College, Westinghouse Club.

SPECIAL TESTS.

Special tests, as follows, were completed during the year:

1. Tests to show the effect of detonating cartridges of 40 per cent "straight" nitroglycerin dynamite in contact with a wire screen.
2. Tests of four grades of trinitrotoluene detonators to determine their efficiency.
3. Tests to determine the effect of the apparent specific gravity of explosives on the compression of small lead blocks.
4. Investigation of the relative sensitiveness of two samples of trinitrotoluene and a sample of tetranitroanalin.
5. Tests of fuse used in copper mining at Santa Rita, N. Mex.
6. Tests to determine the inflammability of coal dust from the Hillcrest mines, Alberta, Canada.
7. Tests to determine the inflammability of coal dust from the McGillivray Creek Coal & Coke Co., Coleman, Alberta, Canada.

J. E. Tiffany, junior explosives engineer, investigated an accidental explosion of dynamite that occurred at Syracuse, N. Y., on May 22, 1915.

During the year, inspections of fuse were made for the Panama Canal by S. P. Howell, explosives engineer, and T. C. Atterbury, junior explosives engineer.

An investigation to determine the best method of destroying explosives was continued during the year.

Tests were continued to determine whether gallery tests in a small gallery can be devised so as to be equivalent to and supplant the more expensive tests in the large gallery tests.

The work described herein was in charge of S. P. Howell, explosives engineer, aided by A. J. Strane, assistant explosives engineer; J. E. Tiffany, J. L. Sherrick (appointed Aug. 8, 1914), T. C. Atterbury (appointed July 2, 1914), and J. Barab (appointed Mar. 22, 1915), junior explosives engineers, and Charles Schuler, shot firer.

CHEMICAL TESTS OF EXPLOSIVES.

Chemical analyses of explosives and the substances used in compounding them are a necessary part of the bureau's investigation of explosives. The explosives chemical laboratory at the Pittsburgh experiment station (1) examines explosives to determine their permissibility for use in gaseous or dusty coal mines or their suitability for use in metal mines, quarries, and tunnels; (2) examines samples of permissible explosives collected in the field in order to determine whether the explosives are being made in accordance with the composition of the samples originally tested by the bureau; (3) examines all explosives purchased by the Panama Canal; and (4) investigates chemical tests, methods of analysis, and the properties of explosives.

Following is a summary of analyses, tests, and determinations made by the explosives chemical laboratory: Analyses of coal-mining explosives, 158; analyses of dynamite and other metal-mining explosives, 56; analyses of detonators and electric detonators, 52; analyses of products of combustion of explosives, 25; physical tests of electric detonators, 157; tests for stability of explosives, 365; tests for exudation, 117; analyses, tests, and determinations not included in the above, 235.

In addition 514 separate determinations and tests were made in developing improved methods of analyzing explosives and 631 separate tests in determining the strength of detonators and the sensitiveness of nitrosubstitution compounds to detonation.

The work of inspecting dynamite, detonators, and electric detonators for the Panama Canal occupied approximately 32 days (estimated as the work of one man). This work was performed by W. C. Cope, assistant chemist, and J. H. Hunter, junior explosives chemist. Mr. Hunter spent 30 days on detail at the Frankford Arsenal in cooperative work for the office of the Chief of Ordnance, War Department.

To insure increased safety in coal-mining operations a representative of the bureau collected samples of permissible explosives as actually used, 33 samples from five different States being procured. Most of these were collected by Mr. Hunter.

This laboratory also analyzed samples of powder obtained by the bureau's mining engineers in their investigations of mine disasters.

The following special work was completed during the year: Investigation for the Isthmian Canal Commission of the stability of nitrostarch explosives, by C. G. Storm, explosives chemist, and J. H. Hunter, junior explosives chemist; report to forest-products laboratory, Madison, Wis., on charcoal for use in the manufacture of explosives, Mr. Storm and J. E. Crawshaw, junior explosives chemist; investigations of sensitiveness to detonation of three samples of trinitrotoluene and tetranitroaniline, for the office of the Chief of Ordnance, War Department, by W. C. Cope, assistant chemist; investigation of deterioration of trinitrotoluene detonators on exposure to moisture, by Mr. Cope and C. A. Taylor, junior chemist; investigation of methods for preparing aliphatic nitrohydrocarbons, by E. J. Hoffman, assistant chemist, and Mr. Taylor; investigation of methods of preparing trinitrotoluene (in progress).

A report on coal-tar products used in explosives, by Mr. Storm, was published during the year, and the manuscript of reports on the analysis of permissible explosives, by Mr. Storm, and on a new method of determining the strength of detonators, the sand test, by Messrs. Storm and Cope, were submitted for publication.

The work of the explosives chemical laboratory was in charge of Mr. Storm until June 15, 1915, when he resigned. At present the work is in charge of Mr. Cope.

MINE INSPECTION IN ALASKA.

The report of Sumner S. Smith, mine inspector for the Territory of Alaska, covering the fiscal year, follows.

INTRODUCTION.

During the fiscal year ended June 30, 1915, the mining industry in Alaska steadily advanced, although the gold output changed only slightly owing to a slight decline in the yield of placer mines. One new copper concentrator, the 500-ton plant of the Beatson Copper Co. at Latouche, was completed, as well as the first unit of the 10,000-ton gold-milling plant of the Alaska-Gastineau Mining Co. at Thane. Both plants embody the latest metallurgical practice. Several small mills and two new cyanide plants have been erected. New discoveries of promising placer ground have been made on the Tolovana River, a tributary of the Tanana, where an extensive area is being thoroughly prospected.

The Territorial legislature at its spring session amended the mine-inspection act and the mining and eight-hour laws, and passed a compensation act. A number of applications for permits to mine coal on 10-acre tracts under the new Federal coal-leasing act have been made to the General Land Office, and development has started in each of the judicial divisions of the Territory.

The work of the Federal inspector has covered the inspection of both lode and placer mines, and of mills, dredges, and quarries, including over 200 properties, although lack of time and an assistant has prevented visits to the more remote portions of the Territory. The Federal Bureau of Mines has cooperated by assembling mining and accident data.

HEADQUARTERS OF INSPECTOR.

The Federal mine inspector has headquarters at Juneau and the Territorial inspector at Nome. Neither the Federal Government nor the Territorial legislature has made provision for offices for these officials. Through the courtesy of the Department of Justice, the Federal inspector occupies a room in the courthouse at Juneau, but this is not available at all times, being used for sessions of the grand jury.

WORK DONE.

The Federal inspector visited the Fairbanks, Manly Hot Springs, Ruby, Iditarod, Nome, Willow Creek (Susitna drainage) Seward, Valdez, Copper River, Juneau, and Ketchikan districts. Over 200 properties have been visited and more than 300 inspections made.

Approximately 8,000 men are employed in and about the mines of the Territory, about 35 per cent in placer mining, 10 per cent in quarries and dredges, and 55 per cent in lode mining. Blank forms for reporting accidents have been distributed to the operators, and whenever possible investigations have been made promptly. Approximately 50 men have been given first-aid training and half that number have been trained in the use of breathing apparatus at the Treadwell mine, and a start has been made in similar work at the Perseverance mine.

MINING LEGISLATION.

At the spring session of the Territorial legislature four important changes were made in the laws affecting mining. The mine-inspection act was amended by the addition of a number of rules for the operation of mines, the offices of the Federal and Territorial inspectors were completely separated, and the Federal inspector was authorized to enforce the Territorial law. Provision was also made for the inspection by the Federal inspector of all coal mines operated under the Federal coal-leasing act. The eight-hour act was amended to include all underground placer mines. An amendment to the mining law compels $100 worth of assessment work for each 20 acres of any association claim located after August 1, 1912. A compensation act, which covers mines or mills in which five or more persons are employed, was passed. Death claims are from $3,000 to $6,000, and disability claims run as high as $6,000. Employers or employees may elect to work or not to work under the provisions of this act, but the employer's failure to come under its provision takes from him the defense of (1) inherent risk, (2) negligence of coemployee, and (3) negligence of person injured, in an action brought by an employee against an employer, the latter being assumed to have been negligent.

PROGRESS OF MINING.

Discoveries of rich ground on the Tolovana River have stimulated prospecting for gold placers, and the high price of copper has turned the attention of the miner to the copper deposits of the coast. The Gold Bullion Mining Co. had its new cyanide plant in the Willow Creek district at the head of Cook Inlet in successful operation all the open season, and new plants have been started for the Appollo

mine at Unga and the Alaska Free gold mine in the Willow Creek district. A new gold dredge has been installed near Hope, and several have been completed through the interior and on the Seward Peninsula. The Beatson Copper Co. at Latouche and the Alaska-Gastineau Mining Co. at Thane have completed new plants. In the mill of the latter company the ore in practically all the crushing is kept dry till the pulp goes to the concentrator tables, the gyratory crusher being followed by rolls. When completed the plant will handle between 8,000 and 10,000 tons of ore per day. The pilot plant of the Alaska-Juneau Gold Mining Co. at Juneau has been in successful operation about a year, and plans are being drawn for a new 8,000-ton mill. The mines of both the Alaska-Gastineau and the Alaska-Juneau Companies have been developed to yield the necessary tonnage, and several properties under development in the same district promise to show similar large ore bodies.

COAL LEASES.

Under the Federal coal-leasing act of 1914 application has been made in each of the judicial divisions of the Territory for 10-acre tracts of coal land to supply local needs. Permits have been granted by the General Land Office for work in the Candle district and on Chicken Creek, Forty-mile Creek, Cook Inlet, and Admiralty Island. In the Candle and Chicken Creek districts the coal will be used largely to thaw the frozen placer gravels and in the southeastern and western parts of the Territory to supply settlements, canneries, and dredges.

LABOR CONDITIONS.

There has been an excess of labor in most of the Territory from the influx of men seeking work on the Government railroad. There were no strikes nor lockouts.

ACCIDENTS.

Exact figures are not yet available, but data on hand indicate that the fatalities did not exceed 20, a decrease from last year, accompanied by a corresponding decrease in serious accidents. As placer mining is necessarily intermittent, data on many accidents can not be had, but blank forms have been mailed to operators by both Federal and Territorial inspectors, with the request that they be returned promptly in compliance with the law. Following the practice of the Federal Bureau of Mines and the provisions of the compensation laws of the various States, the Federal and Territorial inspectors report as serious any accident that detains an employee from his work for two weeks or more. The greatest number of fatalities is from falls of roof, both in placer and lode mining; two prospectors were asphyxiated going down abandoned shafts. Among the serious accidents was an explosion of methane (marsh gas) in a copper mine that burned several men.

FIRST-AID AND MINE-RESCUE WORK.

Systematic first-aid and mine-rescue training has been started in an organized manner. On Douglas Island the Alaska Treadwell Co. has appointed a mine inspector who gives his entire time to

safety conditions underground; the training of employees, with the assistance of the company physician, in first aid; the training of men in the use of breathing apparatus; and in seeing that the first-aid and mine-rescue equipment is in good condition and in its proper places underground. Some fifty men have been trained in first aid and approximately half that number in the use of breathing apparatus. The Alaska-Gastineau Mining Co. and the Kennicott Mines Co. have also equipped their properties with oxygen apparatus and have trained men in its use.

NEEDS OF THE MINING INDUSTRY IN ALASKA.

The following recommendations are offered for the improvement of the mining industry:

(1) That the present Federal mine-inspection law be repealed and one that fits the needs of the Territory enacted.

(2) That a mine-experiment station be established in Alaska under the provisions of the act passed at the last session of Congress.

(3) That the Federal mine inspector be given an appropriation for the equipment and rental of an office and for field assistance.

WORK OF DIVISION OF MINERAL TECHNOLOGY.

The work of the division of mineral technology for the year just passed, under the direction of Charles L. Parsons, has been largely a continuation of the work of 1913 and 1914, as follows: The mining and concentration of carnotite ore and the production of uranium, radium, and vanadium therefrom; the investigation of electric melting furnaces as a means of saving metal wastes in the brass industry; the development of a method for purifying and rendering available the secondary kaolins of the South Atlantic States; the study of methods of melting aluminum scrap and chips to save metal heretofore wasted; the investigation of molybdenum with a view to the utilization of domestic ores.

An extensive investigation has been undertaken, in cooperation with the United States Geological Survey and the Bureau of Standards, of the building-stone industry.

RARE-METALS INVESTIGATIONS.

RADIUM, URANIUM, AND VANADIUM.

Cooperative work with the National Radium Institute has been actively pushed during the past year and has taken a considerable part of the time of the Denver office of the Bureau of Mines. The mining of carnotite ores progressed satisfactorily, 796 tons of carnotite, averaging over 2 per cent uranium oxide, having been mined by the end of the year. The work has been under the direction of K. L. Kithil, mineral technologist, with J. A. Davis, assistant mining engineer, superintendent in charge at the mines.

Valuable data on the mining of this ore have been obtained, and mining methods have been improved. A concentration mill has been built which is successfully treating low-grade ores such as have been heretofore wasted. Ores containing as little as 0.5 per cent uranium oxide can be concentrated and made into a commercial product.

The ore has been produced at a low cost, the total expense for mining, transportation to Denver, and grinding and sampling at the plant averaging, to July 1, $81.30 per ton. This figure takes into consideration all expenses including salaries of Bureau of Mines employees, amortization of plant and equipment, and royalty.

The successful operation of the small experimental plant for the production of radium in Denver led to the plant being increased during the early months of the year to something more than double its previous size, and on February 1 it began operating on an enlarged basis. The plant has been under the immediate charge of R. B. Moore, physical chemist, assisted by O. C. Schaefer as superintendent representing the National Radium Institute, and by Messrs. Lind, Whittemore, and others. The method developed for extracting radium has proved highly successful, more than 3 grams of radium metal having been extracted to July 1 at a cost of less than $40,000 a gram.

Methods have been developed for producing iron vanadate, sodium uranate, and uranium oxide free from vanadium. The extraction of radium from all ores mined by the National Radium Institute has averaged more than 85 per cent of the radium present in the ore. The building and operation of a nitric acid plant have considerably lessened the cost of the acid used in extracting the radium, and increased the efficiency of the process.

The production of crystallized radium salts has not kept up with the extraction of radium in solution, owing to the lack of necessary apparatus for evaporating a strong hydrochloric solution, from which the radium crystallizes much more rapidly than from a neutral solution.

Only one enameled ware thoroughly resistant to hydrochloric acid has been found, and delivery of this ware, produced in France, has been delayed by the European war. As soon as the apparatus ordered has been delivered, within a few months, crystallization will be hastened. By July 1, 1,304 milligrams of radium metal had been crystallized and delivered in the form of bromide to the officers of the National Radium Institute for use in cancer treatment. None of this radium is for sale. Radium as high as 88 per cent radium bromide purity has been produced, although most of that delivered was of lower grade, as 80 per cent salts are not desired or needed for the work in hand.

Much work has been done on quantitative methods of estimating the radium content of different products. Methods that apply to one material frequently can not be used successfully for others. Accurate and reliable quantitative methods are absolutely necessary to the success of any commercial radium work, and such methods have been developed in the Denver office during the past year. The work has not only had a large scientific value but is of the greatest importance in connection with the commercial production of radium. It can now be definitely stated that the mining and production of radium have been greatly improved and cheapened, and that thousands of tons of material heretofore wasted may be concentrated and placed upon the market. It is also believed that a much higher percentage of radium itself is being extracted from the ores than in any other plant that has heretofore handled this material.

TUNGSTEN AND PLATINUM.

Studies of tungsten ores, with especial reference to the mining and treatment of low-grade ores, were continued by Mr. Kithil. Studies of the limited platinum resources of the country were begun, in hopes that methods of increasing the output may be found.

MONAZITE, THORIUM, AND MESOTHORIUM.

A report on the monazite resources of the United States and other countries, the mining methods used, the market for monazite, and other thorium-bearing minerals, and the utilization of thorium residues as sources of mesothorium for the treatment of diseases by radiotherapy was completed by Mr. Kithil.

MOLYBDENUM.

Molybdenite deposits in Arizona, California, Colorado, and Washington, and wulfenite deposits in Arizona were studied by F. W. Horton, mineral technologist, who continued his investigations of methods of concentrating both molybdenite and wulfenite and of processes for the commercial extraction of molybdenum and lead from wulfenite concentrates. These studies have led to the development of a process for treating wulfenite concentrates that is believed to be more efficient and economical than any other in present use.

In connection with other exhibits of the Denver office, a collection of molybdenum ores and products was sent to the Panama-Pacific Exposition that is thought to be the finest that has ever been accumulated.

Owing to the greatly increased demand and the higher price for molybdenum and its products, the bureau's investigation of molybdenum has been particularly timely and has already resulted in establishing a small but promising molybdenum-mining industry where a short time ago none existed. A report on the molybdenum investigations will soon be issued.

NONFERROUS ALLOYS INVESTIGATIONS.

The reduction of the loss of metal in the melting of nonferrous alloys, especially brass, has been the main problem of H. W. Gillett, alloy chemist, and J. M. Lohr, junior alloy chemist, at Cornell University.

Results of an investigation of the losses in fuel-fired furnaces and of the possible reduction of losses by electric melting have shown that electric melting may reduce present metal losses at least half. A longer and more difficult investigation, that of the adaptability of existing types of electric furnaces to commercial brass melting, was begun.

Laboratory tests with some 10 furnaces of some half dozen distinct types, attendance at three commercial tests of furnaces of industrial size by private parties, and information and data on 6 other semicommercial or full-scale tests by private parties have not resulted in the production of an electric furnace truly satisfactory for commercial use, but have eliminated many unsuitable types, and narrowed down to 2, the number of types to be chiefly considered. One

of these is receiving adequate development in private hands by parties who are actively cooperating with the bureau, and the results will be accessible to the bureau.

Melting tests of brass in the other type of furnace last year at the maker's works showed distinct promise. The maker has loaned the furnace to the bureau with permission to make any alterations desired. Preliminary to the development of this furnace, a critical experimental study of various refractories and heat-insulating materials for use in this type of furnace in brass melting was made. The furnace will be given thorough laboratory tests, and if they agree with the preliminary ones in indicating the probable commercial usefulness of the furnace, it will be taken to a brass foundry and tried out under commercial conditions.

The brass-furnace investigations required the development of methods of measuring the temperature of molten brass in experimental electric furnaces. This need has been satisfactorily met, and distinct progress has attended efforts to find a pyrometer that will also meet the needs of brass foundries and rolling mills for a commercially practical instrument.

Another subsidiary problem has been a study of the recovery of aluminum from borings and chips of the metal, in the commercial melting of which the average loss is 30 to 40 per cent. By some methods that seem commercially feasible it is possible to reduce this loss 10 to 15 per cent, that is, to save between 15 and 30 per cent that is now lost. The work is practically completed and the results have been compiled for publication in a technical paper by H. W. Gillett.

Cordial and active cooperation with the bureau is being given by brass foundries and rolling mills, central-station companies, makers of and dealers in refractory materials, and electric-furnace makers and designers in connection with the electric brass-furnace problem; by brass foundries and rolling mills and pyrometer makers in connection with the pyrometer work, and by refiners of aluminum borings in connection with that problem.

The cooperation of G. M. James, of Cornell University, in the work on aluminum borings; of Prof. W. D. Bancroft, of Cornell University, on all problems; and of the department of chemistry at Cornell University in lending laboratory facilities, have all been of great aid.

CLAY-INDUSTRY INVESTIGATIONS.

As the result of a special trip to some of the important clay-working centers, A. S. Watts, consulting quarry technologist, prepared a technical paper on the effect of the European war on the clay industries of the country. The results of his investigations appeared in Technical Paper 99. In addition, attention was given the purification of the secondary kaolins of Georgia and South Carolina. Many of these kaolins carry considerable proportions of impurities that can not be removed by ordinary washing and render the clays almost useless for the ceramic or paper industry. A method has been devised and put into operation in a plant at Macon, Ga., that removes some 85 per cent of these impurities, making the clay far superior to that previously mined, and of much better color. Many tons of this material was produced during the experiment and this is now being tried out on a manufacturing scale by Ira E. Sproat, junior

ceramic chemist, who succeeded Robert Back, resigned, in cooperation with potteries in Ohio. The results will be published in a special report.

QUARRY TECHNOLOGY.

Nearly all the active marble quarries in the United States as far west as central Colorado were investigated, 64 being visited. Cooperative arrangements were made with the United States Geological Survey, the Bureau of Standards, and the Office of Public Roads. Representative marble specimens each weighing approximately 250 pounds, were taken from various quarries and shipped to the Bureau of Standards for testing. The investigations were directed toward two principal objects: (1) Increased safety in stone quarries and a consequent reduction in quarry accidents; (2) increased efficiency in marble quarrying and the elimination and utilization of waste.

Records of the causes of numerous quarry accidents in previous years were obtained, and from the information thus gained, and from examination of conditions in about 100 active quarries it was possible to determine the most prolific sources of danger and the means by which danger may be minimized. Various safety precautions, including the maintenance of machinery, equipment, and quarry walls in proper condition, are suggested, and their need emphasized in a report now in press.

Rock structure and rock imperfections vary greatly from place to place. Every limestone quarry can not be worked in the same way, and, to obtain the highest efficiency, methods must be modified to suit prevailing conditions. Great improvements in methods are possible at most quarries. An encouraging feature of the work is a strong and almost universal demand from quarry operators for information concerning the methods and conditions in the numerous quarries that they are unable to visit. To satisfy this demand a report has been prepared dealing with the varying problems that confront the quarry operator, and describing the different methods and types of machinery that will meet requirements in the most efficient and economical manner.

"Strain breaks" in marble quarries have received special attention. These irregular fractures resulting from rock stresses have caused heavy losses in a number of quarries. Through a study of conditions, and the cooperation of a marble company, a method has been devised of relieving the rock pressure so as to prevent destructive fracturing. As a consequence, great masses of valuable marble that otherwise would be wasted are now utilized.

Investigations of a similar nature to those outlined above are to be conducted during the coming year in the structural limestone and sandstone quarries of the country.

These quarry investigations are in charge of Oliver Bowles, quarry technologist.

WORK OF FUELS AND MECHANICAL-EQUIPMENT DIVISION.

The fuels and mechanical-equipment division is under the supervision of O. P. Hood, chief mechanical engineer, with headquarters at the Pittsburgh experiment station. The organization of the division has been given elsewhere in this report (p. 28).

During the fiscal year 1915 the work of the division included the preparation of plans for engineering laboratories and a power plant for the new buildings at Pittsburgh and the general direction of investigations relating to the utilization of fuels and to safety in mine equipment.

During the year the value of the purchase of coal on a specification basis, when conducted within the limitations determined by experience, has been more fully demonstrated. The bureau has rendered increasing assistance to other Government bureaus and departments as they have become aware of the aid it can give in any problem involving the more efficient use of fuel in Government plants.

Information that points to more rational designs for furnaces and more economical control of furnace fires has been obtained from a study of the combustion processes within and above the burning coal. Work on the problem of increasing the efficiency of heat transmission in steam boilers has begun. Investigation of electrical methods of precipitating smoke has shown that they are not sufficiently developed for practical use.

The bureau's engineers have concluded, after considerable investigation, that the slagging type of gas producer will not furnish a general means of utilizing bony coal and coal high in ash.

Believing that the substitution of approved electric lamps for open lights in all coal mines will greatly lessen the danger of fires and explosions, the bureau's engineers have cooperated with makers of miners' electric lamps in the effort to direct the rapid evolution of safe, efficient, and practicable lamps, approving such as meet the bureau's specifications.

Similar cooperation has been given the development of explosion-proof motors and other electric equipment for mines.

MINE-EQUIPMENT INVESTIGATIONS.

During the year study of the problem of safety in mine equipment took such direction as the limited laboratory facilities at the Pittsburgh experiment station made necessary. The results of investigations of the effect of the exhaust gases from a gasoline mine locomotive on the health of miners, especially the limitations as to the size of engine and the condition of operation, were transmitted for publication.

A study of coal-mine hoisting equipment with especial reference to safety in handling men was begun, the construction, operation, and inspection methods of safety catches on mine cages being noted in an investigation that has covered most of the principal eastern coal fields. Supplementary data were collected on the other factors of the problem of safety in hoisting men.

Mechanism has been designed for use on mine-rescue cars for lighting, charging batteries, and pumping oxygen into containers, for certain equipment in exhibits at the Panama-Pacific Exposition, and for numerous devices used in special investigations.

The mine-equipment work and investigations mentioned was in direct charge of O. P. Hood, chief mechanical engineer.

DEVELOPMENT OF IMPROVED BREATHING APPARATUS.

Rescue crews have to do hard work in the poisonous atmosphere of a mine after an explosion or fire, and the breathing apparatus

they wear must be of the best design and construction. It must be absolutely reliable, must supply an artificial atmosphere of great purity, must be as light as is consistent with strength, and should impede the movements of the wearer as little as possible.

With a view to devising apparatus better than that of foreign make now used, investigations have been carried on at Columbia University, New York, by W. E. Gibbs, engineer of special research. Dr. Yandell Henderson, consulting surgeon, acted in an advisory capacity.

Such a breathing apparatus, a self-contained unit carried wholly on the back of the user, has been developed during the past year by Mr. Gibbs. It is light and its parts are well protected against injury.

By means of a special device oxygen is fed at the rate it is used, and although plenty is available for the wearer when working hard none is wasted when he is resting. Hence the new apparatus may be worn for a considerably longer time without recharging than models now in use. An unusually efficient carbon dioxide absorber that liberates little heat is another feature of the apparatus. Caustic soda, which is much cheaper than the potash salt formerly thought necessary, is used as the absorbent.

As a result of this investigation the United States will soon be independent of foreign makers of breathing apparatus, and the apparatus made in this country will be much better than any available when the investigation began.

Work on a portable electrolytic oxygen generator for use on the rescue cars has progressed enough to show that the cars can be made independent of outside sources of oxygen and that considerable economy will result from the use of the generator.

ELECTRICITY IN MINES.

Investigations relating to the use of electricity in mining and the other mineral industries are made part of the duties of the Bureau of Mines by the terms of its organic act. The purpose of these investigations is to devise and to point out methods for lessening danger from explosions, fires, or shock.

PORTABLE ELECTRIC MINE LAMPS.

During the year the bureau's electrical engineer and his assistants continued investigation of portable electric mine lamps, devising and conducting tests for safety and for practicability. Lamp manufacturers submitted 10 lamps for test. Two of these were rejected without test, one was rejected after complete tests had been made, one was approved, the tests of five others are nearly completed, and the tests of one lamp have not yet been started.

The design and construction of all these lamps were more or less changed by the manufacturers to conform with the bureau's requirements and suggestions. Many conferences were held with lamp manufacturers in the endeavor to assist them in their work.

During the year much information relative to portable electric lamps has been collected, and as a result the bureau completely revised its requirements and published them in Schedule 6A. As a consequence of the bureau's work several desirable improvements

have been made in the design of the lamps, notably those assuring a wider stream of light and more uniform illumination.

Probably the greatest advance through the bureau's efforts has been the improvement of the lamp bulbs, an advance made possible by the cooperation of the principal makers of bulbs in this country, who have agreed to make bulbs according to the bureau's specifications. The bureau's method of testing portable electric lamps has been improved and practically standardized.

The work on electric lamps was carried on by L. C. Ilsley, assistant electrical engineer, and R. W. Crocker, junior electrical engineer.

ELECTRIC SHOT FIRING.

In the coal mines on the segregated Indian lands in Oklahoma, the Secretary of the Interior has, as a result of representations made by the bureau, required the use of outside shot-firing systems or the use of permissible explosives. In this connection outside shot-firing systems in use were examined to ascertain the feasibility of using them in Oklahoma, and operators who were interested in installing such systems were interviewed. Many tests were made, and a report on existing conditions, with recommendations as to outside shot-firing systems, was submitted to the mine operators of Oklahoma. A report on outside shot firing was also submitted for publication by the bureau.

The field work was done by N. V. Breth, mine electrician, and the work at the Pittsburgh station by H. H. Clark, electrical engineer.

EXPLOSION-PROOF MOTORS.

The first motor submitted to the bureau for test and approval for use in gaseous mines was finally approved in October, 1914, after the manufacturer had made extended changes in accordance with the bureau's suggestions.

As no other motors had been submitted at the time that the test of the first motor was completed, all work on explosion-proof motors was stopped. Six more applications for test were received later, but lack of funds prevented the opening of the investigation during the year. Funds are available for tests in the coming year. The work has been done by R. W. Crocker, junior electrical engineer. A technical paper on permissible explosion-proof motors by H. H. Clark, electrical engineer, was published by the bureau.

RULES FOR THE INSTALLATION AND USE OF ELECTRICITY IN MINES.

Much time has been given to drafting a proposed set of rules for the use of electricity underground. The first draft, prepared by C. M. Means, consulting engineer, was completed, sent out for criticism, revised, and sent again for criticism to representatives of the American Institute of Mining Engineers, American Institute of Electrical Engineers, the Mine Inspectors Institute of America, and various manufacturers and mine operators.

OTHER ELECTRICAL WORK.

Among miscellaneous activities of the electrical engineer and his assistants are the following:

Supervision of the portable electric lamps at the bureau's experimental mine, development of a storage-battery lamp for rescue

parties, experiments with a methane detector, tests of gas-filled lamps in the presence of methane, and designing of equipment for the electrical laboratory under construction. A technical paper on electric lights for use about oil and gas wells, by H. H. Clark, electrical engineer, was published.

INSPECTION OF GOVERNMENT FUEL PURCHASES.

The work of fuel inspection is under the immediate direction of G. S. Pope, engineer, assisted by P. M. Riefkin and N. H. Snyder, assistant engineers, and D. M. Obler, J. B. Riefkin, and M. M. Shaw, junior engineers, all with headquarters in Washington. A junior fuel engineer was temporarily stationed in New York City and another at Norfolk, Va., to inspect coal shipments for the Isthmian Canal Commission and the Panama Railroad Co.

The purchase of coal by the Government under contracts that specify the heating value, the ash and the moisture content, and other factors was first adopted in 1906. Now, the plan, variously modified in form but the same in principle, has been adopted by all departments of the Government, and is applied to almost all contracts large enough to warrant samplying and analysis and tests of heating value. The aggregate cost of fuel purchases for the Government under specifications prepared by the Bureau of Mines is now approximately $4,800,000 per annum, and the cost of additional fuel bought under the general advice of the bureau aggregates some $3,000,000 per annum more, making a total value of not less than $7,800,000.

As the specification method had been generally adopted prior to the beginning of the fiscal year, the number of tons of coal purchased under contract for the fiscal year under specifications prepared by the Bureau of Mines did not show any marked increase, and the status of work done was about the same as in the year before, but the simplifying of specifications and the improving of methods of sampling and analysis were given particular consideration.

During the year, 7,527 samples of coal were received for analysis.

The work of fuel inspection includes the collection, analysis, and testing of samples representing coal purchased for the Government under specifications in order to ascertain whether the deliveries conform to the contract stipulations. In such a contract a bidder guarantees the quality of the coal he offers, and the quality guaranteed by the successful bidder becomes the standard of his contract. Analyses of samples of deliveries determine whether the coal delivered is of the guaranteed standard. If it is not, the price to be paid is proportionately decreased; if the coal is of higher quality, the price is proportionately increased.

A number of the States, many of the larger cities, and a large number of corporations and business concerns in different parts of the country have followed the general plans adopted by the Government for the purchase of its coal.

During the year a considerable number of samples of coal from the States of New York, Indiana, Minnesota, and Maryland were analyzed and tested. Authority for doing such work for State governments is given by the new organic act of the bureau.

At the request of the Navy Department, the mining and shipping facilities of mines from which purchase of coal for that department is proposed are carefully examined by engineers of the bureau, and

samples collected in each mine are analyzed at its laboratories. A standard of low ash and volatile matter is fixed, and this standard must be maintained in shipments. Occasionally samples are collected as the coal is being loaded on ships, and if it is not up to the standard, the contractor is promptly notified that his coal must comply strictly with the contract specifications. If he fails to ship coal of specified quality his contract is annulled. Coal purchased under such specifications and used on naval vessels amounts to about 700,000 tons a year.

In order to determine the award of a particular contract, or to advise other bureaus and departments of the Government how a particular coal can be utilized most efficiently, or to ascertain what coal can be burned to best advantage in a particular type of furnace, or what changes in equipment will enable a particular Government building or plant to use efficiently the cheaper coals locally available, the bureau conducts steaming tests at its experiment station in Pittsburgh or cooperates with local engineers in conducting tests.

The success of the specification method depends largely on correct sampling of deliveries, for unless the samples are representative the analyses and tests, however accurate, are worthless. Each year the local employees of Government power and heating plants are becoming more efficient in collecting samples and are thereby insuring the success of the specification method of purchase. However, experience and time will be required to perfect specifications and methods of sampling and analysis that may be used universally. Success now rests almost entirely on sampling. Improper sampling leads to controversies and to condemnation of the specification method. A mechanical device for preparing and reducing samples is needed, for thereby the personal equation can be largely eliminated. The bureau is developing such mechanical devices.

FUEL-INSPECTION LABORATORY.

The fuel-inspection laboratory in Washington, D. C., is engaged chiefly in the analyzing of samples of coal purchased for the Government and determining their heating value. The value of a given coal can be determined from the composition and heating value of a small representative sample. The heating value, which is measured in British thermal units (the amount of heat required to raise the temperature of 1 pound of water 1° F. at 59° F.) or in calories (the amount of heat required to raise the temperature of 1 gram of water 1° C. at 15° C.) gives perhaps more information than any other single test that can be applied. The percentages of moisture, ash, and sulphur in the coal are obviously important, and their determination is a part of the routine work of the laboratory. In connection with this routine work experiments are being made continually with a view to improving analytical methods.

During the fiscal year 1915, 7,594 samples were analyzed. Each analysis was checked by duplicate determinations, and the laboratory sampling was checked by analyzing a duplicate sample. The determinations involved in the year's work are as follows:

Determinations of moisture, 30,544; of ash, 23,173; of sulphur, 14,742; and of volatile matter, 14,481; calorimeter tests, 16,092; miscellaneous determinations, 307; a total of 99,339.

The laboratory was in charge of J. D. Davis, chemist, who reported to the chief chemist at Pittsburgh. Mr. Davis was aided by H. M. Cooper, assistant chemist, and E. L. Wallace, J. G. Fairchild, J. P. Bader, G. Bornscheuer, W. A. Gonzales, and I. M. Bortman, junior chemists. and A. Christie and A. Engel, analysts.

BOILER AND FURNACE EFFICIENCY.

When the Government began the systematic testing of coal at the fuel-testing plant in St. Louis in 1904 the factors controlling the efficient utilization of coal in steam-boiler plants were given especial attention and have since been part of its fuel-testing investigations.

At the close of the fiscal year 1914 unfinished work included tests at Pittsburgh of two types of heating boilers for the Treasury Department and the preparation of a report on saving fuel in heating a house. During the fiscal year 1915 the boiler tests were continued, and recently a new boiler of different design has been substituted for one of those tested. A report on heating a house is in process of publication.

At the request of the War Department, tests of a large number of American coals and of coke, oil, and wood in several types of small residence-heating boilers are to be made. The results will be of great value to the public.

During the year tests have been conducted in connection with the award of contracts for coal at the workhouse for the District of Columbia and at the Carlisle Indian School.

At the request of the Public Printer, acceptance tests of new boiler and stoker equipment for the Government Printing Office power plant were made, and later clinker troubles at that plant were studied. Similar troubles at the power plant in the General Land Office building in Washington were also investigated and were corrected through cooperation with the fuel-inspection section of the bureau.

A representative of the bureau assisted in a test of Matanuska (Alaska) coal on board the armored cruiser *Maryland*. In nearly every way this coal compared favorably with the eastern coal regularly used by the Navy.

Comparative tests were run to ascertain the effect of using a so-called coal-saving powder. Claims of the increased fuel value of coal treated with this powder were not substantiated.

Plans were developed for testing during the coming year various devices for observing or recording the density of smoke.

Conditions in the power plant of the New York Navy Yard were studied, and ways of increasing the output of the power plant and decreasing the amount of smoke were recomended.

The investigations of boiler and furnace efficiency were under the direction of S. B. Flagg, engineer, aided by G. C. Cook, assistant fuel engineer, and R. L. Beers, junior fuel engineer.

FUEL-EFFICIENCY LABORATORY.

The fuel-efficiency laboratory at the Pittsburgh experiment station is making small-scale experiments to ascertain the relative importance of different features of boiler and furnace construction on the capacity and efficiency of steam power plants and the economic utili-

zation of fuels under steam boilers. The work during the year consisted mainly of two groups of investigations, as follows: (*a*) The study of the combustion of coal, with the aim of determining proper designs of furnaces for burning each kind of fuel and the most efficient method of firing it; (*b*) the study of the transmission of heat from the hot products of combustion into the boiler water, in order to obtain accurate data for designing efficient boilers.

THE COMBUSTION OF COAL.

Combustion of solid fuels takes place partly on the grate and partly in the space above and beyond the fuel bed. In the fuel bed the fixed carbon of the fuel is partly burned, and the volatile matter is distilled from the freshly fired coal. In the combustion space above and beyond the fuel bed the volatile matter is burned and also the partly burned fixed carbon that rises from the fuel bed in the form of carbon monoxide.

About 50 tests were made in a hand-fired furnace specially designed for studying combustion, samples of gas being taken and temperatures measured at various heights from the grate. Three kinds of fuels were used—Pittsburgh coal, anthracite coal, and coke.

These tests show definitely that no matter how much air is forced through the fuel bed all the free oxygen is used in the first 3 to 4 inches above the grate. Beyond this height the products of combustion are largely combustible gases, so that if a fuel bed is 4 to 6 inches thick and level the gases rising from it constitute fairly good producer gas. This is true with all ordinary rates of combustion, with 20 to 180 pounds of fuel per square foot of grate per hour, and with all three fuels. Hence, enough air for complete combustion can not be supplied through such a fuel bed more than 4 inches thick, even with forced-draft apparatus, and air must be added over the fuel bed to insure complete combustion and to eliminate smoke.

As regards clinker formation, these tests showed that the ash fuses in the reducing layer of the fuel bed and solidifies and forms a sheet of clinkers as it sinks toward the grate. A series of tests has been started to ascertain the relation between the fusing temperature of ash as determined in the chemical laboratory and the formation of clinker in boiler furnaces.

A report on the process of combustion in the fuel bed is about completed.

In the study of combustion in the space beyond the fuel bed one series of tests with a furnace having a long combustion chamber and a Murphy stoker has been completed. The stoker is being replaced with a hand-fired furnace, and another series of tests is planned with the modified apparatus.

An important conclusion from the investigations made is that with a Murphy stoker efficient combustion of high-volatile coals can not be obtained with a combustion space shorter than 10 feet—a combustion space larger than that used in many commercial plants—so that in those plants efficient combustion is clearly impossible.

HEAT TRANSMISSION INTO STEAM BOILERS.

To investigate the transmission of heat into steam boilers a tubular boiler 20 feet long and a furnace for burning natural gas were used. In future tests the size and length of the tubes of the boiler will be

varied. The tests with this apparatus are well under way, and the results are consistent, accurate methods of temperature measurement at all points of the heat transfer having been developed. The data obtained from these investigations will help to place boiler designing on a rational basis; also hazy ideas on the effect of scale on boiler efficiency will be cleared up.

A report on heat transmission through boiler tubes, by Henry Kreisinger and J. F. Barkley, was completed and is in course of publication by the bureau.

The work of the fuel-efficiency laboratory was in charge of Henry Kreisinger, engineer, assisted by C. E. Augustine, assistant engineer, J. F. Barkley, junior electrical engineer, and E. M. Muncey, physical laboratory aid.

GAS-PRODUCER INVESTIGATIONS.

Investigations of the value of different coals as gas-producer fuel and the study of the factors governing the combustion of fuels in gas producers were begun by the Government at the fuel-testing plant at St. Louis, Mo., in 1904, and were continued at Norfolk, Va., and Pittsburgh, Pa.

Early in the fiscal year 1915 an experimental U-tube gas producer of the slagging type was completed, but owing to a lack of funds tests were suspended in September, 1914, before enough tests could be made to show the operating characteristics of the new design. However, in all of the tests made the slagging of the ash was very unsatisfactory.

The results of the bureau's investigation of the slagging type of producer proved a disappointment, because positive results were not obtained. It is believed, however, that the results obtained are not conclusive and that further study and experiment might give more favorable results. The results of the work done prior to discontinuing the gas-producer investigations have been largely negative, but the following general conclusions may be drawn:

1. With good metallurgical coke and an ample supply of blast-furnace slag for flux, a gas producer of the blast-furnace type may operate continuously and yield good gas and satisfactory slag.
2. With any fuel other than good coke the slag chills and collects in the slag pot, necessitating a shut-down.
3. There is little prospect of bony coals or other high-ash fuels being utilized in slagging producers.
4. With a slagging producer, the problem is not to make satisfactory gas, for the gas is invariably of good quality, but to produce a slag that will not solidify within the producer.
5. The slagging producer is in many respects similar to a small blast furnace and requires more intelligent supervision than the common gas producer.
6. The use of limestone or dolomite as a flux without the addition of blast-furnace slag or some similar substance is unsatisfactory and sooner or later causes chilling of the slag.
7. The high temperatures within the slagging type of producer greatly hasten the deterioration of the brick lining, and make frequent repairs and renewals necessary.

8. Blast-furnace slag being needed for fluxing, the use of the slagging type of producer is limited to localities in which blast-furnace slag is readily and cheaply obtained.

9. The need of using metallurgical coke as fuel practically eliminates the slagging producer from consideration for most industrial uses.

The investigation of slagging gas producers was conducted by C. D. Smith, engineer, aided by F. E. Woodman, assistant engineer.

USE OF COKE AS DOMESTIC FUEL.

An investigation of the possible extension of the use of different kinds of coke as domestic fuel with a view to lessening the production of smoke in cities where high-volatile coals are burned for most purposes is being conducted by C. D. Smith, engineer.

COKING OF COAL AND RECOVERY OF BY-PRODUCTS.

In its efforts to lessen waste of high-grade coals in the manufacture of coke through the use of more efficient devices than the beehive oven and the utilization of lower-grade coals, the Bureau of Mines has kept in touch, through correspondence and inspection of plants, with progress in by-product coking.

The possibility of increasing the manufacture of coal-tar products in the United States and the supply of raw materials therefor was investigated, and a technical paper on the subject, by H. C. Porter, was published.

Small-scale experiments on the low-temperature distillation of coal and the recovery of oils and other by-products were begun.

These inquiries were in charge of H. C. Porter, chemist.

STORAGE AND SPONTANEOUS COMBUSTION OF COAL.

On October 1, 1914, the final analyses were made in connection with a 5-year test of the deterioration of high-grade steaming coal used by the Navy Department. The results of these tests and of other storage tests of different coals under various conditions are being compiled for publication. This investigation has been carried out by H. C. Porter, chemist, assisted by F. K. Ovitz, assistant chemist, and later by the general analytical laboratory under A. C. Fieldner, chemist.

Studies of the causes and the methods of controlling spontaneous combustion in stored coal were continued. Several cases of spontaneous fires in the coal stocks of Government establishments were investigated and recommendations for lessening the hazard were made. Careful laboratory experiments were made by S. H. Katz, assistant physical chemist, to ascertain the rate of oxidation of coal and the effect of the size of coal on the passage of air through a pile or a bin of it. The bearing of these factors on spontaneous heating was shown by experiments with large piles of coal, made by H. C. Porter, who investigated the cases of spontaneous heating in coal stocks and had general charge of the investigations.

STUDIES OF OXIDATION OF COAL.

The oxidation of coal at ordinary temperatures was studied in the laboratory at Pittsburgh, by S. H. Katz, in order to ascertain the primary cause of spontaneous heating and deterioration of stored coal, and to find out why different coals vary in ease of ignition.

MOISTURE IN COAL.

In the course of an investigation to determine the mode of occurrence of water in coal, experiments made to ascertain the effect of size of the coal on the draining of the mechanically held water showed that in some instances six or eight times as much water was retained by finely divided coal or slack as by screened lump coal, and that much of the water in coal, the proportion differing with the kind of coal, is held in a state of hydration. This hydrated water is more difficult to remove by drying than free superficial moisture. Results of the investigations were compiled in a technical paper on the water in coal, by H. C. Porter and O. C. Ralston.

INFLAMMABILITY OF COAL DUST.

Ignition of coal dust and other inflammable dusts in air was studied in order to determine whether inflammability depended on the ease of distillation of volatile matter, the ease of oxidation as a whole, or some other property. G. B. Taylor, assistant chemist, made many experiments, in which a cloud of coal dust was momentarily heated. The results have seemed to indicate the amount of distillation that takes place. This investigation is still in progress.

CARBONIZATION OF COAL.

The carbonization of coal in coke ovens and gas retorts and in furnace fuel beds was studied in the laboratory by Mr. Taylor. Some of the results were used in connection with some of the tests of fuel efficiency in boiler furnaces.

INVESTIGATIONS OF PEAT AND LIGNITE.

The investigation of peat is specifically authorized by the act of Congress establishing the Bureau of Mines. The bureau's investigations of both peat and lignite are of especial importance to those people who live remote from good coal fields but near extensive unused deposits of these fuels.

Before the Government's investigation of peat began, little was known of the extent of the peat deposits in the United States or of methods of extracting, drying, and preparing peat, or of the practicability of producing peat fuel at a profit and on a commercial scale. To get definite information about these and related subjects was the aim of the work planned; similar work was arranged for lignites.

Investigations during the past year have therefore continued technical, scientific, and educational work begun in former years. Peat deposits in parts of the country, as Maine and Minnesota, where cooperation was asked by State authorities, were examined and

sampled. Samples of peat thus collected from public lands and State lands have been analyzed to determine their value for fuel and other purposes.

This work has already shown that large areas of peat of considerable value lie near great iron mines in northern Minnesota, which are now being worked entirely by coal brought a thousand miles or more from Ohio, Illinois, and Pennsylvania. Work in foreign countries has shown that peat can be used for generating producer gas or steam in large power plants. With properly designed producer-gas plants, a large percentage of the combined nitrogen in the peat can be recovered as sulphate of ammonia, at so low a cost that when the nitrogen of the peat is 1.5 per cent by weight, the ammonia recovered will pay the entire cost of plant operation and the producer gas, an excellent fuel for engines, or for boiler firing, can be obtained free of cost.

Analyses show that the American peat of the regions investigated during the year is exceptionally rich in nitrogen and is of good fuel value, and, if properly gasified, its yield of ammonia would be large compared with that recovered from gasifying coal and other fuels. These peat beds thus contain a great and neglected source of combined nitrogen, easily convertible into ammonia, which is one of the most valuable and costly constituents of chemical fertilizers, and is now imported in large quantities from European countries. Not only do the Minnesota peat deposits contain an unusually high percentage of nitrogen, but the peat has good fuel value and can be utilized by processes that are known to be thoroughly practicable on a large commercial scale.

The samples collected in previous years were analyzed both physically and chemically, not only to determine their value as fuel but also to learn the conditions under which vegetable matter accumulates and decomposes into peat.

A study of peat and lignite with a view to solving certain problems relating to some of the properties of coal has been continued.

Unusual lignites and lignitic shales, termed oil shales, underlie great areas in Colorado and Utah, and in places are 3,000 feet thick. When heated these shales yield petroleum. Thin sections cut with the microtome have been examined under the microscope in order to ascertain the origin of the material that yields the petroleum. Also, this work, which supplements that of the petroleum division of the bureau on the same material, may develop improved methods of obtaining petroleum from the rock.

Interesting and important facts, some of them seemingly new to science, have already been established. These deposits of carbonaceous matter seem to be in the early stages of coal formation, but contain much material easily converted into petroleum, and their study may throw light on the origin of petroleum and enable the situation of oil pools to be more accurately predicted than at present.

Some of the oil-yielding rock studied in this work would make good fuel for properly designed gas producers. This fact adds importance to the study of the shale, which is in a region where workable coal beds are scarce or absent.

An important phase of the investigation of peat and similar fuels has been the dissemination of information regarding their possible

uses. More than 500 letters were written in answer to requests for information about peat alone.

During the year cooperative work has been carried on with the State Geological Survey of Minnesota and with the United States Geological Survey.

The peat and lignite work, as heretofore, has been carried on by Charles A. Davis, geologist.

WORK OF METALLURGICAL DIVISION.

Up to the beginning of the past fiscal year the funds available were insufficient for the bureau to conduct any detailed metallurgical investigations other than those relating to smelter smoke. Some general inquiries as to accidents and to health conditions in metallurgical plants had been projected, and a study of accidents at blast-furnace plants and steel works had been started. Also, the bureau had given attention to the development of electric furnaces for metallurgical work, had taken up an investigation of methods of sampling ores and metals, and in cooperation with the University of Utah had begun an inquiry as to the extent of the low-grade complex nonferrous ores of that State and the possibility of developing processes whereby these ores might be profitably treated.

With the organization of a metallurgical division under F. G. Cottrell, chief chemist, inquiries and investigations have been correlated and a general plan for the conduct of necessary work has been outlined.

SMELTER SMOKE.

In the investigation of smelter smoke work already under way was extended and new inquiries, especially those relating to processes for removing sulphur from smelter gases, were begun at the San Francisco experiment station.

A study of the relationship between the forms in which arsenic trioxide is formed in flue dust and the bearing of this relationship on the recovery of arsenic trioxide was completed, and the results were published in a technical paper by H. V. Welch, assistant physical chemist, and L. H. Duschak, chemical engineer.

Work on the chemical reactions involved in various methods proposed for the recovery of elemental sulphur in the roasting of sulphide ores extended through the year. The experiments necessary have been nearly completed, and a report on the results of the work is to be prepared for publication by the bureau.

A critical study of the Thiogen process proposed for recovering sulphur from smelter gases was begun at the end of the year.

The use of various substances as carriers in a process for recovering pure sulphur dioxide from dilute smelter gases is being investigated.

Experiments are in progress with towers of special design for cleaning and cooling smelter flue gases.

Cooperative work with the Anaconda smelter commission, which is investigating complaints of injury by smoke from the smelter of the Anaconda Co. and is studying methods of rendering the smoke harmless, continued through the year.

The cooperative work with the Selby Smelter Commission, although chiefly done during the previous fiscal year, was not completed until October, 1914. The report of the commission with the accompanying reports of various experts is soon to be published as a bulletin of the Bureau of Mines. The value of this work is attested by the adoption of the general plan and of many of the details of procedure used by the Selby commission in an extensive investigation being conducted by smelting interests near Salt Lake City, Utah. At least three minor investigations by different companies or bodies have employed features of the Selby commission's work, and many inquiries regarding the methods and the findings of the commission have come to the Bureau of Mines. Hence the Selby commission may be regarded as having done important pioneer work in a field where systematic, unbiased inquiry has long been needed.

The smelter-fume and other metallurgical investigations of the bureau are under the general supervision of F. G. Cottrell, chief chemist. In the smelter-smoke investigations Mr. Cottrell has had the aid of L. H. Duschak, chemical engineer, A. E. Wells, metallurgist (appointed Oct. 14, 1914), G. N. Libby, assistant metallurgist, G. C. Bartels, jr., assistant physical chemist (appointment terminated Aug. 12, 1914), H. V. Welch, assistant physical chemist, and Wood Freeman and E. H. Zeitfuchs, junior chemists.

HYDROMETALLURGY OF GOLD AND SILVER ORES.

Through the cooperation of the Nevada Mine Owners' Association, and of various metallurgical companies and manufacturers of supplies, laboratory facilities were provided in the hydrometallurgical division of the cooperative metallurgical exhibit at the Panama-Pacific International Exposition at San Francisco, by which the bureau was enabled to begin preliminary investigations relating to the cyanide process.

STANDARDIZATION TESTS FOR THE CYANIDE PROCESS.

As there are no standard methods for the various laboratory determinations necessary for the control of the cyanide process, work on the standardization of sizing tests and other determinations was begun and is now well under way.

CYANIDATION OF SILVER ORES.

An investigation of the cyanidation of silver ores was started, ores from the Tonopah district, Nev., being used, because they were available and the Nevada Mine Owners' Association was willing to cooperate. As a first step, the proportions in which the silver minerals occur in the ores were determined by F. B. Laney, geologist, of the United States Geological Survey.

The next step was the determining of the behavior of the silver minerals, singly and in combinations, under the conditions of commercial cyanide practice. This work is in progress.

Another problem under investigation is the settling of slimes. So far the only work done has been to survey conditions in the mills at Goldfield and Tonopah, Nev.

The behavior of aluminum in dilute cyanide solutions is being studied, on account of the growing use of aluminum for precipitating gold and silver from cyanide solution and the occurrence of soluble aluminum salts in certain ores, especially some in the Goldfield district.

The work on the cyanide process is under the direction of G. H. Clevenger, consulting metallurgist.

The University of Utah cooperated in this work by detailing Prof. R. H. Bradford and H. J. Morgan, holder of a fellowship, to San Francisco during the period of the exposition.

TREATMENT OF LOW-GRADE AND COMPLEX ORES.

At present there are great losses in the treatment of lead and zinc ores, because of the difficulty with which the metal-bearing minerals are separated, and millions of tons of ore in many mining districts can not be successfully concentrated or treated directly by methods now in use.

In its endeavor to aid in the upbuilding of mineral industries the Bureau of Mines in January, 1914, began work, under a cooperative agreement with the State of Utah, to determine the feasibility of devising more efficient methods of treating the low-grade and complex nonferrous ores in that State.

Since then the nature and extent of these ores in Utah have been studied, and a similar study has been undertaken in Idaho and Colorado. As a result of this work many important facts have been determined that bear on the metallurgy of these ores, and especially their concentration by oil flotation, acid leaching, chlorodizing roasting, and electrolytic precipitation.

The purposes of the investigations are as follows: (1) To ascertain the feasibility of applying metallurgical processes already proposed in the prevention of metal waste or the treatment of low-grade and complex nonferrous ores; (2) to devise new processes or modify existing processes for the prevention of metal waste in the treatment of such ores.

These investigations, under the direction of D. A. Lyon, metallurgist, are being conducted by O. C. Ralston, assistant metallurgist, J. F. Cullen, junior chemist, and holders of five fellowships awarded by the State University of Utah.

SMELTING OF TITANIFEROUS IRON ORES.

Titaniferous iron ores (mixtures of magnetite and ilmenite) are not regularly mined and smelted in the United States at present. The occurrence and character of these ores and the difficulty of separating the magnetite and ilmenite by magnetic concentration have been described by the Bureau of Mines in a bulletin published in 1913. With the steady depletion of the best iron ores and with constant progress in ore-dressing methods some titaniferous ores are relatively of much higher grade to-day than they were 10 years ago, but opinion as to the smelting of the ores has not advanced commensurately. In the blast furnace titaniferous ore has the reputation of being a source of refractory slags, of "building" in the hearth and the bosh, and of high fuel consumption.

Through the McIntyre Iron Co., the bureau was enabled to observe the smelting of mixtures of titanic and nontitanic concentrates at

Port Henry, N. Y., in the summer of 1914. During a furnace run of nearly two months good iron was made, and the furnace "trouble" was not serious nor attributable to the titanium in the charge. There was no "building" in the hearth. The results of the bureau's study will be published soon as a technical paper.

The investigation of titaniferous ore was conducted by J. F. Cullen, junior chemist, under the direction of D. A. Lyon, metallurgist.

MINING AND MILLING OF LEAD AND ZINC ORES.

Investigations of mining and milling methods in the lead and zinc districts of Kansas, Missouri, Illinois, and Wisconsin with especial reference to reducing the losses of metal under existing practice were continued.

A detailed study of conditions affecting efficiency in the lead and zinc mines and mills of the southwestern Missouri district was begun during the year in cooperation with the State of Missouri. The work comprises the study of the following details: (1) The ore and gangue minerals and the geology of the deposits; (2) the efficiency of the milling practice; (3) changes in milling methods with reference to the ore and the improvements possible on a commercial basis; (4) the possibility of using an oil-flotation process for recovering lead and zinc minerals; (5) mining methods.

Interesting and valuable data were obtained from the study of the efficiency of the milling practice and also from the experiments with oil flotation. This study is to be continued and a report on it is to be published. A report on mining and milling methods in the Wisconsin lead and zinc district was completed and published during the year.

These lead and zinc investigations were conducted by C. A. Wright, assistant metallurgical engineer.

SAFETY AND EFFICIENCY AT BLAST FURNACES.

An investigation of safety problems at blast furnaces received increasingly cordial cooperation from officials of iron and steel companies. In the course of field work, 51 plants in 7 States were visited, these plants representing 141 furnaces and 18,000 employees. The work of the year embraced the determination of the hazards to which workmen are exposed during regular and during emergency duties; the study of the physical and metallurgical features of furnaces and furnace equipment at places where fatal, unusual, or other accidents typical of furnace practice have occurred; the investigation of methods of work, and the design, practicability, and working of safeguards; and the relation of furnace design, practice, and plant layout to safety. Three reports have been prepared for publication, and work is in progress on a comprehensive bulletin, addressed to furnace men, in which accident prevention about furnaces is being treated technically. In March, 1915, a cooperative agreement with the State of Pennsylvania was concluded, and an intensive study of blast-furnace plants in cooperation with the State department of labor and industry was begun. By this arrangement possible duplication of work by national and State agencies is avoided, and thorough study is assured.

The work already done demonstrates the need of educational and advisory work for the benefit of small or isolated establishments, the need of field and laboratory investigations of subjects intimately related to purely metallurgical hazards, and the advisability of occasional supplementary special studies. Through lack of funds the study of methods of increasing efficiency had to be subordinated to safety investigations, but the year's work has emphasized the need of investigating the relation of furnace slags to the grade of iron produced, the determining of means of judging, by chemical and physical tests, the behavior and effect of different grades of coke in the furnace, the obtaining of experimental data on the efficiency of boilers and hot-blast stoves burning blast-furnace gas, and the study of factors that in the regular working of the furnace govern the proportion of off-grade iron produced.

Because the problems of safety and efficiency that await attention are pressing and the investigation as a whole is of great importance, additional facilities in the way of special apparatus and equipment should be provided.

The investigation was conducted by F. H. Willcox, metallurgical engineer.

SAFETY AND EFFICIENCY IN STEEL MAKING.

The Bureau of Mines began preliminary investigations relating to safety and efficiency in steel-plant operation early in the fiscal year, J. M. Sampson, iron and steel metallurgist, being in charge. Mr. Sampson made a general survey of steel plants in certain parts of the country in order to ascertain what measures were being taken to prevent accidents, and had begun the preparation of two reports when he resigned in December, 1914. The work was suspended until the appointment of James Aston as metallurgical engineer on April 1, 1915.

In order to obtain first-hand information regarding plant organization, conditions, and methods, and to meet officials who are in touch with safety problems, Mr. Aston visited 17 steel plants. At these plants he was given every facility for obtaining necessary information, and the officials not only showed a desire to aid the work of the bureau but welcomed any suggestions that might lessen hazards or accidents at their plants. Under a cooperative agreement with the department of labor and industry of the State of Pennsylvania the steel plants of that State will receive especial attention during the coming fiscal year. Many officials of steel works have stated that the elimination of waste in steel making should be studied by the bureau, some of the important problems being the efficient utilization of heat, relative merits of different processes and fuels, and the recovery of by-products.

CORROSION OF METALS IN MINES.

The prevention of corrosion of metals in mines is a different problem from that of preventing ordinary atmospheric corrosion. Some mine waters are extremely corrosive, whereas others are harmless. In many mines, especially copper and coal mines, the waters are acid from the oxidation of sulphur minerals. In an attempt to reduce the

loss of metals by corrosion and accidents caused by defects resulting from corrosion, the Bureau of Mines is accumulating data on the methods used to prevent the corrosion of pumps, pipes, wire ropes, and other metallic objects by acid waters and other corrosive agents, and is conducting related experiments.

Much information has been collected as to the action of acid mine waters on pumps and pipes and the methods used to prevent corrosion. These methods are being compared to determine their relative merits under different conditions. Information on different lining materials, such as wood, lead, cement, mastic, brass, bronze, and enamels, has been collected also. The resistance of various bronzes to corrosion has been studied.

Data on the greasing and preservation of wire ropes in mines with especial reference to the prevention of corrosion have been gathered, and the different wire-rope lubricants on the market have been studied.

This investigation was in charge of O. W. Storey, chemist.

WORK OF PETROLEUM DIVISION.

The petroleum division of the Bureau of Mines is concerned with problems bearing on the increase of safety and efficiency and the lessening of waste in the development of oil and gas fields, and the storage, transportation, and use of petroleum and petroleum products, including natural gas. On July 1, 1914, W. A. Williams was appointed chief petroleum technologist, and proceeded to organize the division. Through this division the Bureau of Mines is cooperating with the Bureau of Indian Affairs in the inspection of oil and gas wells on Indian lands.

FIRES AT OIL WELLS AND TANKS.

A special investigation of fires at oil wells and tanks for storing oil was made by G. B. James, a chemical engineer in the employ of the Chicago Fire Underwriters' Laboratories, of Chicago, Ill. A report of this investigation is being revised for publication by A. G. Heggem, petroleum engineer, and W. F. Rittman, chemical engineer. E. W. Dean, junior organic chemist, is assisting Mr. Heggem in the chemical work.

WELL-DRILLING METHODS.

In order to demonstrate improved methods of drilling wells, whereby great loss of gas and the invasion of oil and gas sands by water may be prevented, Mr. Heggem, with headquarters at Tulsa, visited the oil and gas fields in Oklahoma.

WORK OF PETROLEUM LABORATORIES.

Work has been done at three petroleum laboratories, at Pittsburgh, Pa., San Francisco, Cal., and Washington, D. C. The Pittsburgh laboratory is fully equipped for routine analyses, and has considerable equipment for special research work, and has available machine shops, with skilled machinists, glass blowers, and mechanics for the

construction of special apparatus. It also has the advantage of excellent library facilities and assistance from chemists engaged on allied problems, and is the bureau's principal petroleum laboratory.

The laboratory at San Francisco is equipped to make analyses of fuel oils from the California fields and to do research work. The laboratory at Washington is similarly equipped as regards special research work.

During the year, in cooperation with Columbia University, New York, the bureau made use of special apparatus there, which the bureau could not have duplicated at the Pittsburgh laboratory owing to lack of funds.

EXAMINATION OF PETROLEUM AND ITS PRODUCTS.

In the chemical and physical examination of petroleum and its products, approximately 7,500 separations were made at the Pittsburgh laboratory during the year. Seventeen crude petroleums and their distillates were carefully examined with respect to distillation, specific gravity, refractive index, surface tension, molecular weight, and viscosity. W. A. Jacobs and Oscar Byron, junior chemists, were engaged in this work.

CRACKING OF PETROLEUM.

A new method for the manufacture of benzol, toluol, and other aromatic hydrocarbons from petroleum was developed, and patent application was filed. A process for the manufacture of low-boiling gasolines from kerosene and other distillates was developed and patent application made. The patents for these two processes, known as the Rittman processes, will be dedicated to the public. An agreement was entered into with the Aetna Explosives Co. for the development of the mechanical features of the processes, the company agreeing to expend not less than $200,000 in this work, and in addition agreeing that the Government should retain all rights to any patentable devices, processes, etc., developed during the life of the cooperative agreement and resulting therefrom.[a] As a result of this agreement, furnaces and necessary additional equipment have been designed for the successful conversion of heavy petroleum distillates and residues into lighter petroleum hydrocarbons with lower boiling points.

During the year work for the development of the Rittman processes was successfully carried on in cooperation with Columbia University, as well as with the Aetna Explosives Co. at Pittsburgh. The results will be described in two reports, one covering methods of distillation, and the other discussing methods of converting heavy oils into gasoline and the manufacture of benzol, toluol, and allied hydrocarbons from petroleum.

The work was under the immediate supervision of W. F. Rittman, chemical engineer, at Pittsburgh.

DISTILLATION OF PETROLEUM.

The analytical distillation of petroleum has been investigated with a view to furnishing information that would explain the widely different distillation results obtained by different chemists analyzing

[a] This contract with the Aetna company was canceled August 24, 1915. The company has been granted a license to use the process.

the same oils. The results of this investigation, soon to be published, are expected to be of much aid in bringing about the use of uniform distillation methods in the examination of petroleum.

BIBLIOGRAPHY OF PETROLEUM.

Decided progress was made on a large bibliography of petroleum which has been under way for several years. A. S. Crossfield, at the San Francisco laboratory, gave much time to the supervision of this work.

I. C. Allen, chemist, was also engaged in this work, as well as in work connected with his appointment as oil commissioner to the Panama-Pacific Exposition.

INSPECTION OF FUEL OIL FOR CANAL COMMISSION.

The laboratory at San Francisco, which was established in July, 1914, has examined samples of fuel oil purchased by the Isthmian Canal Commission, and determined coefficients of expansion of California oils, under Mr. Crossfield's direction.

DISTILLATION OF OIL FROM OIL SHALES.

The work of the Washington laboratory under the direction of David T. Day, consulting chemist, included the fractionation of oil obtained from lignitic or "oil" shales in Colorado, Utah, and other States. Dr. Day also assisted Dr. Rittman in the development of the Rittman processes at Pittsburgh. Some 50 distillations of oil shales and analyses of the resulting oils were made in the Washington laboratory during this time. About 40 specimens of crude petroleum were examined for the United States Geological Survey and an investigation of methods of distinguishing groups of hydrocarbons was begun.

STORAGE OF PETROLEUM.

A. G. Heggem, petroleum engineer, investigated the storage of petroleum and the risk of fires, visiting points in Oklahoma, Texas, and Louisiana, and began a report on the investigation. The report will suggest possible precautions for the prevention and extinguishing of fires at wells and tanks. It will also discuss the effects of design and construction of tanks on loss of oil by evaporation during storage.

INFORMATION REGARDING OIL WELLS AND OIL LANDS IN CALIFORNIA.

J. H. G. Wolf, petroleum engineer, assisted by R. W. Andrews, consulting engineer, and H. V. Goodrich, petroleum geologist, was engaged in the collection of oil-field information and the compilation of maps. During the year he assisted the Department of Justice in preparing special suits against the Southern Pacific Railroad Co. and against operators illegally operating on withdrawn lands.

Mr. Goodrich was engaged for a short time under the direction of Mr. Wolf in the preparation of a report on underground water conditions in the Sunset field, California.

rock dust collected from the atmosphere of zinc and lead mines in the Joplin district of Missouri and Kansas; and 4 miscellaneous samples, making a total of 1,241.

From fuel-testing investigations were received 782 samples, mostly of coal, coke, ash, residual fuel, clinker, petroleums, asphalt rock, and slag.

From the mineral-technology division were received 220 samples of iron ore, 1 sample of steel, and 1 sample of copper.

In all, 3,325 samples were received; in their analysis 32,687 determinations were made.

A bulletin on analyses of mine and car samples of coal collected in the fiscal years 1911 to 1913, by A. C. Fieldner, chemist, and H. I. Smith, A. H. Fay, and Samuel Sanford, engineers of the bureau, was published during the year. A technical paper entitled "Notes on the sampling and analysis of coal," by A. C. Fieldner, was also published during the year, and a technical paper by A. C. Fieldner and C. A. Taylor on the determination of nitrogen in coal, comparing various modifications of the Kieldahl method with the Dumas methods, was submitted for publication.

PERSONNEL.

The personnel of the analytical laboratory during the year included A. C. Fieldner, chemist, in charge; W. A. Selvig, assistant chemist; F. D. Osgood, H. H. Hill, G. G. Taylor, G. E. Postma, and V. P. Hawse, junior chemists.

FUELS-GAS LABORATORY.

In studying the combustion of coal in boiler furnaces a great many samples of combustible matter, solid, liquid, and gaseous, both from the fuel bed and from the combustion space above and beyond it, are collected and analyzed. This work is being done by the fuels-gas laboratory in cooperation with the engineers conducting fuel-efficiency investigations. The purpose of these investigations and the results obtained during the year have been described on pages 66 to 68.

During the year 1,878 samples of gas and 179 samples of soot were collected and analyzed in this study of combustion. In addition, 128 samples of gas from heating-boiler tests and 44 samples of gas from heat-transmission tests were analyzed.

The fuels-gas laboratory was in charge of F. K. Ovitz, assistant chemist, aided by A. L. Smith, junior chemist, and E. T. Gregg, physical laboratory aid.

PHYSICAL LABORATORY.

TESTING OF APPARATUS.

Physical apparatus and instruments used in the various laboratories of the bureau and in the field were tested in the physical laboratory at Pittsburgh. The total number of such tests during the year was 188.

A heat-retaining vessel for carrying hot food to men engaged in rescue work in mines was developed.

INFLAMMABILITY OF COAL DUSTS.

Determinations of the inflammability of coal dusts from different mines, different beds, and different coal fields form an essential part of the bureau's investigations of mine explosions. Obviously it is not practicable to test more than a comparatively small number of dusts in the experimental mine, and a reliable laboratory method of determining inflammability is required.

As tests at the experimental mine showed that certain dusts that developed no measurable pressure in the laboratory tests previously made were capable of propagating explosions, more delicate laboratory tests became necessary, and the apparatus and method formerly used were modified so as to be applicable for determining the inflammability of the least inflammable dusts that are capable of propagating an explosion in the experimental mine. The new laboratory method is sensitive to dusts containing as high as 80 per cent of shale dust.

Inflammability tests of 614 samples of coal dust from 26 States were made, and an investigation of the inflammability of coal dust in air containing small percentages of combustible gases was carried out.

At Urbana, Ill., in cooperation with the Illinois geological survey and the mining department of the University of Illinois, the inflammability of mine dusts from the Danville district was tested, and the investigation of the inflammability of Illinois coal dusts was completed. The results of the tests are given in a bulletin by J. K. Clement and L. A. Scholl, jr., which has been submitted for publication.

The physical laboratory was in charge of J. K. Clement, physicist, assisted by J. N. Lawrence, assistant physical chemist, and L. A. Scholl, jr., junior chemist, who resigned October 1, 1914.

INVESTIGATIONS OF MINE GASES AND NATURAL GAS.

Many samples of mine air are collected and analyzed in the course of investigations in mines after fires and explosions, or in studying the ventilation of mines. In addition, samples of mixtures of natural gas and air are collected and analyzed in connection with tests of explosives or with explosion tests at the experimental mine. Some mine-air samples are collected and analyzed at the request of coal-mine operators or of State mine inspectors in attempts to remedy dangerous conditions.

All samples of mine air, mine gases, and natural gas are analyzed at the Pittsburgh experiment station under the direction of G. A. Burrell, chemist, aided by I. W. Robertson, G. G. Oberfell, and A. W. Gauger, junior chemists, G. J. Jones, assistant physical chemist, and E. N. Weisberger, laboratory aid.

Research work undertaken in the year included the determination of the limits of inflammability of mixtures of methane and air, with respect to conditions necessary to cause gas explosions in mines. The results are given in a report by Messrs. Burrell and Oberfell, which is in course of publication.

The results of an investigation of the chemical and physical properties and the physiological effects of natural gas and the composition of natural gas as supplied to 25 different cities in the United

States were submitted for publication as a technical paper by Messrs. Burrell and Oberfell. Messrs. Burrell and Robertson determined the vapor pressures of various hydrocarbons of the paraffin series at temperatures below their boiling points. The results of the work, which bear on the separation of the different hydrocarbons, are being compiled for publication.

During the year a bulletin on the condensation of gasoline from natural gas, by Messrs. Burrell, Seibert, and Oberfell, was published by the bureau.

At the suggestion of G. A. Hulett, consulting chemist, a strong, simple, and portable device for detecting methane or other combustible gases in air has been developed. It will be described in a forthcoming report.

In addition to the work mentioned above an investigation of the air in a tunnel was made for the city of Milwaukee, and 25 samples of natural gas were analyzed for the United States Geological Survey.

Work was started by Messrs. Burrell, Seibert, and Robertson on the critical constants of the gases that comprise natural gas and their deviation from Boyle's law.

INFLAMMABILITY OF GASOLINE VAPOR.

Under a cooperative agreement with the city of Pittsburgh the Bureau of Mines undertook an investigation of the conditions causing explosions of gasoline vapor in the sewers of that city. The proportion of gasoline vapor necessary to make an explosive mixture with air was determined, as was the quantity of gasoline necessary to give off that amount of vapor in a large sewer. Two papers embodying the results of this work, one on the limits of inflammability of mixtures of gasoline vapor and air and the other on the quantity of gasoline necessary to cause explosions in sewers, were prepared by G. A. Burrell and H. T. Boyd, the latter representing the city of Pittsburgh.

Another paper, describing in simple, nontechnical terms the hazards involved in handling gasoline and the precautions that should be taken in its use, was prepared by Mr. Burrell and is being published.

SEPARATION OF HYDROCARBONS IN NATURAL GAS AND IN ARTIFICIAL GAS.

In connection with the investigations relating to the occurrence and use of natural gas and various petroleum products, many analyses and tests have been made in the laboratory at Pittsburgh. One of the investigations related to the separation of the paraffin hydrocarbons in natural gas by fractional distillation at low temperatures and pressures, and another dealt with the separation of the illuminants in coal gas and water gas by the same method, both investigations having an important bearing on the study of the destructive distillation of fuels. The results of the investigations are being published in a technical paper by Messrs. Burrell, Seibert, and Robertson.

EXPLOSIBILITY AND OTHER PROPERTIES OF MINE GASES.

A report on the explosibility of mine-fire gases by G. A. Burrell was submitted for publication. A report dealing with the liability of explosions from the use of acetylene in mine lighting, by Messrs. Burrell and Oberfell, is being published, as is a report on the effects

of atmospheres low in oxygen on small animals by the same authors. A report on black damp in coal mines is nearly ready for publication.

STUDIES OF THE ORIGIN AND CONSTITUTION OF COAL.

A knowledge of the chemical and physical nature of the substances constituting coal is an important aid in attaining efficiency in the utilization of coal and in understanding the behavior of different coals in burning. Also, such knowledge is of especial value in considering the causes of dust explosions in mines and mills and in determining why some coals coke and others do not.

Investigations of the nature of the constituents of coal included three lines of research, as follows:

(1) Chemical studies of the soluble constituents, phenol being used as a solvent, by E. J. Hoffman, assistant chemist, during a part of the year; (2) microscopic studies of lignite and coal, especially coal from the Pittsburgh bed in the experimental mine at Bruceton, Pa., and coal from Royalton, Ill., by Reinhardt Thiessen, assistant chemist, with particular regard to the original constituents of the coals, their transformations, and their present physical condition as bearing on the coking of coal and the inflammability of coal dust; (3) studies of the decomposition of coal by heat and of the primary products thus formed, in connection with investigations of the coking of coal and the by-products of coking, as noted elsewhere, under the direction of H. C. Porter, chemist.

FUSIBILITY AND CLINKERING OF COAL ASH.

In connection with specifications for the purchase of coal for the Government a satisfactory laboratory method of determining the probable clinkering tendency of any coal is urgently needed, especially for coal for naval use, for which coal with little tendency to clinker is demanded. An investigation of the fusibility of coal ash as affected by the gases in the fuel bed of a furnace has shown that ashes are most fusible in reducing atmospheres, the iron in clinker slags being chiefly in the ferrous state. A new method and a special electric furnace were then developed to determine the "lowest softening temperature" of an ash, by heating the ash in an atmosphere of hydrogen and water vapor, so as to cause the iron oxide of the ash to combine principally as ferrous oxide. A report on the fusibility of coal ash and its relation to clinker formation is in preparation.

This investigation is being carried on by A. C. Fieldner, chemist; A. E. Hall, assistant chemist; and A. L. Feild, junior physical chemist.

PROGESS OF OTHER INVESTIGATIONS.

PLACER-MINING METHODS.

An investigation of placer-mining methods in the United States, with especial regard to the prevention of accidents and the possible obtaining of larger returns through a closer recovery of precious metals, has been started. An investigation of gold dredging was begun, and a preliminary report on this important branch of mining is now in course of preparation. Further work planned contemplates cooperation with the United States Geological Survey in a

comprehensive report on placer and hydraulic mining in the United States.

Data for the report on gold dredging were collected by corresponding with dredge operators, by going to the more important dredging fields, and by visiting the more prominent designers and constructors of dredges. The response to the bureau's inquiries has been very encouraging, and many promises of assistance have been received. Operating costs and other data, hitherto most carefully guarded by dredge operators, have been freely furnished for use in the report.

Some interesting experiments have been made in connection with a study of improving the methods of saving gold on dredges, and a continuation of this work is proposed. The report on gold dredging, which will be ready for publication in 1916, will contain many details of dredge construction and operation.

The work described above has been in charge of Charles Janin, consulting engineer.

RULES TO PREVENT ACCIDENTS IN METAL MINES.

A committee of consulting engineers, comprising Messrs. W. R. Ingalls, chairman, J. Parke Channing, James Douglas, J. R. Finlay, and John Hays Hammond, that has been engaged for several years in preparing a report on the prevention of accidents in metal mines, completed its labors during the fiscal year, and its report is now being published as a bulletin of the Bureau of Mines. The work comprises a complete code of rules for metal mines, a discussion of the reasons that led the committee to adopt the precise wording for certain rules, and a consideration of metal-mine accidents, with especial reference to some of the larger accidents and their immediate causes. The rules represent not only the opinions of the members of the committee, but also those of many mining engineers, mine operators, and makers of mining supplies, who were consulted in the course of the work, and for this reason it is believed that the rules will have the approval of those persons interested in the development and enforcement of better laws.

MINE AND FUEL ECONOMICS.

A study of some commercial and marketing problems of the mineral industries is being made with the purpose of developing a clear conception of matters that must be regarded in attempts to increase efficiency in the use of mineral resources. The work thus far has dealt chiefly with the problems arising from the rapid increase in the production of coal and petroleum in certain fields, and the resulting competition that unduly lessens and wastes resources.

During the year A. G. White, associate mine economist, visited the oil fields of Oklahoma and California to study methods of production and marketing. He also made a fuel survey of Salt Lake City, Utah, with a view to developing a cooperative study of the smoke problem there, a problem largely the result of the household use of coal containing much volatile matter. With the increasing cost of anthracite coal, which has been used so largely in the Eastern States, the problem of abating smoke from bituminous coal in house stoves and furnaces becomes of greater importance and its systematic attack from different points is highly desirable.

A study of some fuel problems of the Pacific coast was begun. The use of fuel oil has increased so rapidly and has so lessened the local demand for coal that a summary of the present situation with regard to fuel supply and power development seems highly desirable in order that producers and users of fuel may understand the trend of conditions. A report of the investigation will be completed in the next few months. A similar study with regard to coal and oil fields in Kansas, Oklahoma, and Texas is planned.

IRON-ORE MINING.

A large bulletin on iron mining in the United States, work on which has been intermittently progressing for several years, is being completed by D. E. Woodbridge, consulting engineer. During the year work was interrupted by the illness of Mr. Woodbridge, but the bulletin is expected to be ready for publication within a few months.

CONCENTRATION OF SILICEOUS IRON ORES.

An investigation of the siliceous red hematites in the Birmingham district of Alabama by J. T. Singewald, jr., assistant geologist, was finished during the year.

Many millions of tons of low-grade siliceous ores lie unworked in the Birmingham district, and the purpose of the investigation was to ascertain what improvement in the ores could be effected by fine crushing and washing. The results of the investigation, which are to be published in a bulletin by Mr. Singewald, show that crushing increases the percentage of iron and decreases the percentage of silica in the fine material, and indicate that concentration on a commercial basis should be profitable.

DEVELOPMENT OF IRON MAKING IN THE UNITED STATES.

Work on a bulletin entitled "The Story of Iron," which is to present a comprehensive review of the development of iron making in the United States, was interrupted by the illness and death of John Birkinbine, metallurgical engineer, who had been compiling the data. The bulletin is being completed by his son, J. L. W. Birkinbine, consulting metallurgical engineer.

PRODUCTION OF ALLOY STEELS.

Special alloy steels, such as are used in mining and milling equipment or are needed by the Government for many different purposes, have been studied by H. D. Hibbard, steel metallurgist. The purpose of this study, which was completed during the year, was to ascertain how the metals used in making these steels can be utilized to the best advantage. A technical paper discussing the characteristics and uses of alloy steels is now in press.

SOME ENGINEERING PROBLEMS OF THE PANAMA CANAL.

A bulletin discussing the geologic conditions in the Canal Zone, and their bearing on mining, quarrying, and excavating methods in the construction of the Panama Canal, prepared by Donald F. Macdonald, geologist, after his temporary transfer from the United States Geological Survey to the Bureau of Mines, in January, 1914, has been completed and is in course of publication.

SPECIAL PRODUCER-GAS INVESTIGATIONS.

General investigations relating to the increase of efficiency in the utilization of fuel in gas producers have been conducted by the Bureau of Mines since its establishment. During the fiscal year 1914 a field survey of the economic value of the gas producer and the operating details of producer-gas installations in the United States was completed.

The unrestricted use of high-grade fuels in the United States and the ruthless waste and neglect of lower-grade fuels that should be of real commercial value are in sharp contrast to the conservation and successful use of the latter class of fuels in Europe. In order that the true significance of these important industrial problems might be more fully presented to the public, an attempt was made during the summer of 1914 to procure, through personal inspection, definite information on the following details:

1. The utilization of high-ash coal.
2. The use of wood refuse and other similar material.
3. The recovery of by-products, such as ammonium sulphate, tar, and pitch.
4. The recent developments in the use of peat as producer fuel.
5. The results of low-temperature distillation of fuels.
6. The possibilities of the slagging type of gas producer.
7. The use of powdered fuel.

PROGRESS MADE IN THE WORK.

The owners and operators of producer-gas installations in the United States responded well to the request for data. The material obtained was submitted for publication as a report entitled "Operating Details of Producer-Gas Installations."

Inquiries in Europe progressed well until, just as work was under way in Germany, the great war broke out, absolutely shutting off further research and preventing the obtaining of valuable information and photographs that had been promised. The notes obtained were prepared for publication as a technical paper on the use of low-grade fuels in Europe.

Some important recent developments in the use of low-grade fuels are as follows:

1. The installation, about two years ago, of the first large producer unit in this country. The developments resulting from this installation indicate that it may be the forerunner of the central power plants at mines utilizing high-ash fuel.
2. The inquiries by European concerns as to the possibility of by-product gas plants in the peat areas of Florida.
3. The installation, about a year ago, by a European company of a by-product plant in the United States situated at the mines and utilizing roof coal and other refuse material.
4. The possibilities of successfully using high-ash clinkering fuels in producers having eccentric revolving grates.
5. The wood-refuse gas producer.
6. The slagging type of gas producer.

The investigations described above were undertaken by R. H. Fernald, engineer.

METALLURGICAL PRACTICE IN THE UNITED STATES.

Work on a general review of metallurgical practice, more especially the smelting of gold and lead ores, in the United States was continued by C. H. Fulton, consulting metallurgist, until January 1, 1915, when owing to the lack of available funds the work had to be suspended. Part of the information compiled by Mr. Fulton was published in a bulletin on metallurgical smoke, and more of the information is now in course of publication as a technical paper on the buying and selling of ores and metallurgical products.

SAMPLING AND ASSAYING OF ORES AND METALLURGICAL PRODUCTS.

Methods of sampling and assaying in mills and metallurgical plants have been investigated, with the purpose of recommending methods that will be accepted by producers and by purchasers of gold, silver, copper, and lead ores, and will obviate disputes between buyers and sellers of ores and metals as to the relative merits of different methods of sampling and assaying. This work is being carried on by three investigators, one of whom is giving attention to the sampling of the ores, another to the sampling of metals, and a third to methods of assaying ores and metallurgical products. The work of these investigators is being correlated by G. H. Clevenger, consulting metallurgical engineer.

ORE-SAMPLING METHODS.

The investigation of the sampling of ores was made by T. R. Woodbridge, consulting metallurgical chemist. A report of the results of his investigation, which shows that inaccurate and careless practice has prevailed at many sampling plants, is soon to be published.

ASSAY METHODS.

A report on methods of assaying ores and metallurgical products was completed by W. J. Sharwood, consulting metallurgical chemist.

METHODS OF SAMPLING METALS.

A report on methods of sampling metals was revised and completed by Edward Keller, consulting metallurgical chemist. It will soon be published.

UTILIZATION OF LIGNITE.

In continuation of the efforts to aid the development of methods for utilizing as fuel the vast deposits of lignite in the West, especially in the Dakotas and neighboring States, the Bureau of Mines has had a cooperative agreement with the School of Mines of the University of North Dakota, under the direction of Dr. E. J. Babcock. The importance of this investigation is due to the wide extent of the lignite fields, the lack of better fuels in that part of the West, and the need of special methods in order to utilize the lignite efficiently.

The general purpose of the cooperative work has been to point out the characteristics of lignite and to develop better appliances for burning and otherwise utilizing it. Modifications in grate, furnace, and stove construction have received attention, but most of the work has been on methods of carbonizing and gasifying and the treatment

and utilization of valuable by-products such as lignite residue, gas, tar, tar oils, tar acids, and ammonia. Little work has hitherto been done in this country on the carbonization and gasification of lignite and the recovery of the by-products.

Attention is being given the type of oven best adapted for carbonizing lignite and recovering by-products on a commercial scale, and the investigations may be expected to lead to the development of lignite by-products industries, as well as to better methods of utilizing the great deposits of lignite in the Western States.

In the cooperative work carried on by the Bureau of Mines and the University of North Dakota, assistance has been rendered by the mining experimental substation of the university, at Hebron, where there is a well-equipped briquetting, carbonizing, and gas plant for the treatment of lignite.

Lignite does not coke, and the rather fine residue from gasifying, though it contains the fixed carbon, is not in a desirable form for commercial use. However, tests have shown it can be made into briquets of convenient size which satisfactorily withstand weathering and transportation, and make an excellent fuel for domestic or power purposes.

The yield of gas, suitable for power and heat, and under certain conditions for lighting, is large. Different lignites yield different proportions of ammonia and "tar acids," both having commercial value. The yield of the "tar acids" is noticeably high, as is that of phenols and cresols. A considerable yield of a peculiar lignite tar, which seems to be rather high in paraffin and light tar oils, is also recovered. The light oils seemingly may be satisfactory fuel for internal-combustion engines.

ADMINISTRATION.

FINANCIAL STATEMENT.

The total sum appropriated by Congress for expenditure by the Bureau of Mines during the fiscal year ended June 30, 1915, was $730,500.

The following statement shows the appropriations made for the year and the amounts disbursed from the appropriations.

Amounts appropriated for and expended by the Bureau of Mines for the fiscal year ended June 30, 1915.

Title of appropriation.	Amount.	Repayments.	Available.	Disbursements.	Balance subject to voucher or claim.
General expenses	$70,000.00	.....	$70,000.00	$69,948.07	$51.93
Investigating mine accidents	347,000.00	$1,603.75	348,603.75	348,461.18	142.57
Equipment for mine-rescue cars and stations	30,000.00	.....	30,000.00	29,821.02	178.98
Equipment for testing plant	10,000.00	.....	10,000.00	9,992.14	7.86
Testing fuel	135,000.00	426.11	135,426.11	135,388.64	37.47
Mineral-mining investigations	100,000.00	.....	100,000.00	99,947.76	52.24
Investigations of petroleum and natural gas	25,000.00	.....	25,000.00	24,968.76	31.24
Inspecting mines in Alaska	5,500.00	.....	5,500.00	4,601.35	898.65
Books and publications	1,500.00	.....	1,500.00	1,493.34	6.66
Land for mine-rescue cars	1,000.00	.....	1,000.00	36.00	964.00
Mine-rescue station, McAlester, Okla	5,500.00	.....	5,500.00	5,500.00	.....
Total	730,500.00	2,029.86	732,529.86	730,158.26	2,371.60

PERSONNEL.

On June 30, 1915, there were 418 employees on duty in the Bureau of Mines, 402 of whom held Secretary's appointments, they being distributed and classified as indicated in the following table:

Number of appointees on duty in the Bureau of Mines, June 30, 1915.

Location.	Classification and number of appointees.			
	Technical.	Clerical.	Non-clerical.	Total.
Washington	[a] 30	48	[b] 23	101
Pittsburgh	[c] 102	29	[d] 36	167
Field in general	[e] 105	22	7	134
Total	237	99	66	402

[a] Engineers, 7; chemists, 11; miscellaneous, 12.
[b] Includes such employees as elevator conductor, electrician, watchman, messenger, and laborer.
[c] Engineers, 42; chemists, 29; miscellaneous, 31.
[d] Includes such employees as fireman, watchman, oiler, carpenter, shot firer, janitor, machinist's helper, and laborer.
[e] Engineers, 30; chemists, 21; miscellaneous, 45, including miners.

In addition to the employees enumerated in the table, there were 16 unskilled laborers, including cooks, employed on field agreements, 4 of whom were in Pittsburgh and 12 in the field in general, or a total of 418 employees on duty June 30, 1915, an increase of 34 appointees and a decrease of 26 on field agreements as compared with the preceding fiscal year.

The total number of changes in status requiring the approval of the Secretary of the Interior and consisting of appointments, reinstatements, transfers, promotions, reductions, separations, extensions of limited appointments, etc., was 466. The number of changes in status on field agreements issued by the director with the approval of the Secretary of the Interior, and including employment, separation, promotion, or reduction, was 446, or a total of 912 in all, being a decrease of 118 from the preceding fiscal year.

Grants of leave during the past calendar year were made to 347 of the 402 appointees, as follows: Annual, 6,310 days; sick, 928 days; without pay, 3,047 days; military, 60 days. This leave was covered by approximately 3,449 applications, or 734 more than the previous year.

MAILS AND FILES.

The number of pieces of mail matter, both incoming and outgoing, handled in the Washington office aggregated about 225,000. The general inquiries from the public for information on different phases of the bureau's activities showed a considerable increase over those of the previous fiscal year. The work of handling the correspondence required the services of a clerk in charge and of two filing and withdrawal clerks.

PUBLICATIONS.

The Bureau of Mines publishes three classes of reports—bulletins, technical papers, and miners' circulars. In addition it issues various lists and schedules, a monthly statement of fatalities in coal mines, and the annual report of the director.

Most of the bulletins present in detail the results of technical and scientific investigations, and therefore are of interest chiefly to engineers, chemists, mine officials, and other persons familiar with the subjects discussed. The technical papers are shorter and less formal than the bulletins, and contain preliminary statements of the results of the larger investigations, or describe the shorter investigations incidental to a larger one. The miners' circulars deal with topics relating to accident prevention and rescue and first-aid methods, the safeguarding of health, and other matters that directly concern the workers in mines, mills, and metallurgical plants. These circulars are written in simple, nontechnical English, and are printed in much larger editions than are the bulletins and technical papers. The bulletins, technical papers, and miners' circulars issued during the fiscal year ended June 30, 1915, are summarized in the following statement:

BULLETINS.

Bulletin 38. The Origin of Coal, by David White and Reinhardt Thiessen, with a chaper on the formation of peat, by C. A. Davis. 1914. 390 pp., 54 pls.

The results of microscopic examinations of coal samples are interpreted to show how coal was formed.

Bulletin 72. Occurrence of Explosive Gases in Coal Mines, by N. H. Darton. 1915. 248 pp., 7 pls., 33 figs.

Summarizes existing knowledge of the occurrence of methane in coal beds and describes in detail investigations in the northern anthracite coal basin of Pennsylvania and the southern part of the bituminous coal field of Illinois.

Bulletin 76. United States Coals Available for Export Trade, by Van. H. Manning. 1914. 15 pp., 1 pl.

Briefly describes the general character and commercial quality of the coals most available for export.

Bulletin 77. The Electric Furnace in Metallurgical Work, by D. A. Lyon, R. M. Keeney, and J. F. Cullen. 1914. 216 pp., 56 figs.

Discusses different types of electric furnaces, their construction and efficiency.

Bulletin 80. A Primer on Explosives for Metal Miners and Quarrymen, by C. E. Monroe and Clarence Hall. 1915. 125 pp., 15 pls., 17 figs.

Treats of the use of fuse, detonators, and electric detonators, drilling and blasting methods, and construction, care, and use of magazines and thaw houses.

Bulletin 81. The Smelting of Copper Ores in the Electric Furnace, by D. A. Lyon and R. M. Keeney. 1915. 80 pp., 6 figs.

Gives the results of experiments in smelting native copper concentrates and sulphide copper ores and compares the electric furnace with the blast furnace and reverberatory furnace.

Bulletin 83. The Humidity of Mine Air, with Especial Reference to Coal Mines in Illinois, by R. Y. Williams. 1914. 69 pp., 2 pls., 7 figs.

Discusses humidity in mines and on the surface during the seasonal changes of a complete year and methods of humidifying mine air to lessen the danger from dust explosions.

Bulletin 84. Metallurgical Smoke, by C. H. Fulton. 1915. 94 pp., 6 pls., 15 figs.

A discussion of metallurgical smoke and ways and means of removing sulphur dioxide, flue dust, and fume from the smoke, and thus rendering it harmless to vegetation.

Bulletin 85. Analyses of Mine and Car Samples of Coal Collected in the Fiscal Years 1911 to 1913, by Arno C. Fieldner, Howard I. Smith, Albert H. Fay, and Samuel Sanford. 1914. 444 pp., 2 figs.

Describes methods of collecting and analyzing samples of coal. Gives analyses of samples and notes on the mines in which the samples were taken.

Bulletin 87. Houses for Mining Towns, by J. H. White. 1914. 64 pp., 8 pls., 9 figs.

Treats of plans for and arrangement of mining towns and the construction of houses, and briefly discusses water supply and sewage disposal.

Bulletin 88. The Condensation of Gasoline from Natural Gas, by G. A. Burrell, F. M. Seibert, and G. G. Oberfell. 1915. 106 pp., 6 pls., 18 figs.

Describes the growth of the industry. Discusses methods of condensation, transportation, and blending with reference to lessening waste of gas.

Bulletin 90. Abstracts of Current Decisions on Mines and Mining, December, 1913, to September, 1914, by J. W. Thompson. 1915. 176 pp.

Record of decisions of Federal and State courts of last resort on questions relating to the mineral industry.

TECHNICAL PAPERS.

Technical Paper 34. Experiments with Furnaces for a Hand-Fired Return Tubular Boiler, by S. B. Flagg, G. C. Cook, and F. E. Woodman. 1914. 32 pp., 1 pl., 4 figs.

Discusses tests made to determine the effects of various constructions used to increase furnace efficiency in burning bituminous coal.

Technical Paper 45. Waste of Oil and Gas in the Mid-Continent Fields, by R. S. Blatchley. 1914. 54 pp., 2 pls., 15 figs.

Describes conditons in different pools, gives estimates of waste, and makes recommendations looking to its prevention.

Technical Paper 65. A Study of the Oxidation of Coal, by H. C. Porter. 1914. 30 pp., 12 figs.

Discusses the physical-chemical reactions between oxygen and the coal substance.

Technical Paper 76. Notes on the Sampling and Analysis of Coal, by A. C. Fieldner. 1914. 59 pp., 6 figs.

Discusses factors affecting accuracy of sampling and analysis and outlines methods used by the Bureau of Mines.

Technical Paper 77. Report of the Committee on Resuscitation from Mine Gases, by W. B. Cannon, G. W. Crile, Joseph Erlanger, Yandell Henderson, and S. J. Meltzer. 1914. 35 pp., 4 figs.

Points out defects of some mechanical devices for causing artificial respiration and administering oxygen to persons overcome by carbon monoxide. Recommends a special device.

Technical Paper 79. Electric Lights for Oil and Gas Wells, by H. H. Clark. 1914. 8 pp.

Briefly calls attention to desirable features of electric lamps to be used at oil or gas wells where inflammable gas may collect.

Technical Paper 80. Hand Firing Soft Coal Under Power-Plant Boilers, by Henry Kreisinger. 1915. 83 pp., 32 figs.

Describes best methods of firing soft coal and handling fires, and discusses losses in power generation.

Technical Paper 81. The Vapor Pressure of Arsenic Trioxide, by H. V. Welch and L. H. Duschak. 1915. 22 pp., 2 figs.

Gives results of experiments and describes apparatus.

Technical Paper 85. Production of Explosives in the United States During the Calendar Year 1913, compiled by A. H. Fay. 1914. 15 pp.

Summarizes figures from manufacturers of explosives, showing production and distribution by States.

Technical Paper 88. The Radium-Uranium Ratio in Carnotites, by S. C. Lind and C. F. Whittemore. 1915. 29 pp., 1 pl., 4 figs.

Describes experiments to determine value and constancy of the radium-uranium ratio in carnotite ores.

Technical Paper 89. Coal-Tar Products and the Possibility of Increasing Their Manufacture in the United States, by H. C. Porter, with a chapter on Coal-Tar Products Used in Explosives, by C. G. Storm. 1915. 21 pp.

Discusses the possibility of increasing the production of coal tar and of developing the manufacture of dyestuffs, drugs, and chemicals derived from it.

Technical Paper 90. Metallurgical Treatment of the Low-Grade and Complex Ores of Utah, a Preliminary Report, by D. A. Lyon, R. H. Bradford, S. S. Arentz, O. C. Ralston, and C. L. Larson. 1915. 40 pp.

Mentions the extent of the ore bodies, the chemical characteristics of the ores, and the proposed methods of treatment.

Technical Paper 92. Quarry Accidents in the United States During the Calendar Year 1913, compiled by A. H. Fay. 1914. 76 pp.

Summary of data received from quarry operators and owners.

Technical Paper 94. Metal-Mine Accidents in the United States During the Calendar Year 1913, compiled by A. H. Fay. 1914. 73 pp.

Summary of reports received from prospectors, mine owners, and mine operators.

Technical Paper 95. Mining and Milling of Lead and Zinc Ores in the Wisconsin District, Wisconsin, by C. A. Wright. 1915. 39 pp., 2 pls., 5 figs.

Describes mining and milling practice and discusses the efficiency of the methods and the possibility of improvement.

Technical Paper 99. Probable Effect of the War in Europe on the Ceramic Industries of the United States, by A. S. Watts. 1915. 15 pp.

Discusses the effect of the war in relation to the ceramic industry abroad, the kaolin resources of the United States, and the probable increase of domestic manufacture.

Technical Paper 101. Permissible Explosion-Proof Electric Motors for Mines; Conditions and Requirements for Test and Approval, by H. H. Clark. 1915. 14 pp., 2 pls., 1 fig.

States conditions and requirements for test and approval of motors; describes motors already approved.

Technical Paper 118. Coke-Oven Accidents in the United States During the Calendar Years 1913 and 1914, compiled by A. H. Fay. 1915. 16 pp.

Summary of data received from coke-oven operators and owners.

MINERS' CIRCULARS.

Miners' Circular 16. Hints on Coal-Mine Ventilation, by J. J. Rutledge. 1914. 22 p.

Mentions some of the causes of poor ventilation and states what the miner can do to insure good air.

Miners' Circular 17. Accidents from Falls of Rock or Ore, by Edwin Higgins. 1914. 15 pp., 8 figs.

Outlines principal causes of falls of rock or ore and discusses preventive measures.

Miners' Circular 19. The Prevention of Accidents from Explosives in Metal Mining, by Edwin Higgins. 1914. 16 pp., 11 figs.

Miners' Circular 21. What a Miner Can Do to Prevent Explosions of Gas and of Coal Dust, by George S. Rice. 1915. 24 pp.

Discusses causes and prevention of explosions and gives suggestions on self-rescue.

EDITORIAL WORK.

The editorial work of the year included not only the editing of manuscript and the reading of proof of all reports and forms printed for the bureau, but also the examination of all material submitted for illustrations and the preparation of accepted material for engraving.

During the year 12 bulletins, 18 technical papers, and 4 miners' circulars were published, as follows: Bulletins 38, 72, 76, 77, 80, 81, 83, 84, 85, 87, 88, 90; Technical Papers 34, 45, 65, 76, 77, 79, 80, 81, 85, 88, 89, 90, 92, 94, 95, 99, 101, 118; and Miners' Circulars 16, 17, 19, and 21. The contents of these publications have been summarized in the preceding statement.

The other reports published included the annual report of the director, the report of the mine inspector for Alaska, 12 monthly statements of coal-mine fatalities in the United States, a revised schedule of fees for testing portable electric mine lamps, a schedule of fees for testing miners' safety lamps, lists of publications, and statements relating to the progress of investigations.

Seven miners' circulars were revised and reprinted in one or more editions, and one report (Bulletin 76) was printed in Spanish and Portuguese as well as in English.

In addition to the work done on the publications enumerated, the text of 53 other publications was edited, and illustrations for 31 of these were prepared for engraving.

The editorial work was in charge of S. Sanford, engineer. Two editorial assistants and a stenographer were employed throughout the year.

DISTRIBUTION OF PUBLICATIONS.

During the fiscal year ended June 30, 1915, the Bureau of Mines distributed 953,485 copies of its publications, including 90,793 bulletins, 579,423 miners' circulars, 171,797 technical papers, 11,140 annual reports, and 100,332 miscellaneous publications. The number of letters of inquiry received concerning publications was 65,311. The distribution of publications was in charge of John L. Cochrane, statistician, and required the services of a junior clerk and six under clerks.

BUREAU OF MINES LIBRARY.

The main library of the Bureau of Mines was organized in the Washington office early in 1911. This library contains chiefly Government and State reports, statistical works, and other books for general reference, and serves as a central bureau of information for the bureau's branch offices. It now totals 11,000 volumes, largely reports of other bureaus and departments and of States and foreign coun-

tries, most of these reports having been obtained by exchange. During the past year 1,697 volumes have been acquired. The number of technical and scientific books is altogether inadequate.

At the Pittsburgh, Denver, and San Francisco offices of the bureau, small branch libraries have been established to serve the immediate needs of investigators. These libraries are growing with the needs of investigators, and the work of the main library has increased in proportion. In addition to ordering and distributing all publications received, the library at Washington endeavors to supply investigators at Washington and at the experiment stations of the bureau with articles or books as requested, and to bring to their attention material available in other offices of the bureau.

The library received (through exchange or purchase) about 300 scientific and technical periodicals. These are checked and distributed daily to the branch libraries or to investigators in the field. Edith M. Spofford, librarian, was in charge of the work described.

COMPUTING, DRAFTING, AND PHOTOGRAPHIC WORK.

Nearly all of the computing, drafting, and photographic work for the investigations conducted at the experiment stations and laboratories of the bureau and in the field was done, as during previous years, at Pittsburgh. The work for the year included:

1. Computations, mathematical investigations, and plotting of curves involved in the reduction of test data.

2. Drawings for design and development of new equipment, mine maps, plans of grounds and buildings, statistical charts, and illustrations for reports.

3. Photographing to show progress of investigations, and mining, mine-rescue, and first-aid methods, and the making of lantern slides, enlargements, and photostat and blue prints.

4. Motion pictures illustrating various mineral industries of the country and others showing mine-rescue, first-aid and safe methods of mining. Forty thousand feet of motion-picture negatives have been made illustrating various mining operations, transportation and use of the products, quarrying and working of building stone, and cement making.

5. Motion-picture films and lantern slides were loaned to organizations of miners or mine operators for use at safety meetings, conventions, etc. Lists of lantern slides and motion pictures have been made and distributed. One hundred and seventy reels of motion-picture films were loaned to 95 organizations of mining men at their educational meetings, and reports of the attendance seem to warrant the statement that the pictures have been shown before at least 100,000 miners. Also, 3,843 lantern slides were loaned for the same purpose, and, it is estimated, were shown to 70,000 miners.

6. Cooperation with the architects and builders of the new Bureau of Mines buildings at Pittsburgh.

7. Preparation of exhibits of the Bureau of Mines at the Panama-Pacific International Exposition and work on plans for "The Mine."

The work mentioned above was under the supervision of Lauson Stone, engineer.

MINING AND METALLURGICAL EXHIBIT AT SAN FRANCISCO.

COOPERATIVE METALLURGICAL EXHIBIT.

In collaboration with a number of the large smelting companies and allied industrial interests there was organized at the Panama-Pacific Exposition the so-called "cooperative metallurgical exhibit," consisting of a group of metallurgical testing laboratories and a collection of operating models and full-scale equipment illustrating present practices in metallurgy. The exposition presented an opportunity for bringing together the mining and smelting companies, particularly those handling copper, lead, and precious-metal ores, in a cooperative undertaking for the dual purpose of presenting to the public a comprehensive exhibit of metallurgical work in the West, and conducting a series of investigations on problems of fundamental and general importance.

The cooperative metallurgical exhibit occupies a space of approximately 7,000 square feet in the Palace of Mines and Metallurgy. A fund of $15,000 was subscribed for the undertaking, in addition to the loans of metallurgical equipment and apparatus representing an investment of at least $25,000 additional. The exhibit was awarded a gold medal of honor by the jury of award.

"THE MINE."

Adjoining the block in the Palace of Mines and Metallurgy containing the cooperative metallurgical exhibit is an exhibit named "The Mine," built by the Bureau of Mines through the assistance of about 20 mining-machinery and safety-appliance companies. It illustrates metal and coal mining methods, the operation of different types of mining machinery, and the use of approved mine-safety appliances. Methods of mining gold, silver, lead, copper, iron, and hard and soft coals are realistically shown. Full-size entries, drifts, stopes, and rooms selected from typical mines in various parts of the United States are reproduced, and motion pictures shown in a part of "The Mine" illustrate such mining and metallurgical features as could not be shown otherwise except by small-scale models.

The companies cooperating with the Bureau of Mines contributed a lump sum of approximately $21,000 for construction and maintenance of "The Mine" during the exposition; each mining company furnished in addition a carload of ore and material, and the machinery and safety-appliance companies furnished equipment for supplying the mine in accordance with approved standards.

It is estimated that the daily average attendance at "The Mine" up to June 30, 1915, has been nearly 8,000 persons; on special days the attendance ran as high as 10,000, and one day was 50,000. From 300 to 500 people were present at the daily mine explosion and mine rescue and first aid demonstration.

Ten men were employed in "The Mine." Thirteen pieces of compressed-air and electric mining machinery were operated simultaneously. The exhibit received high praise from miners and mine operators, mining journals, and Government officials, and was awarded a gold medal of honor by the jury of award.

LAWS GOVERNING THE WORK OF THE BUREAU.

NEW ORGANIC ACT.

The new organic act of the Bureau of Mines was signed by the President on February 25, 1913. The text of this act (37 Stat., 681) is as follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the act to establish in the Department of the Interior a Bureau of Mines, approved May sixteenth, nineteen hundred and ten, and the same is hereby, amended to read as follows:

"That there is hereby established in the Department of the Interior a bureau of mining, metallurgy, and mineral technology, to be designated the 'Bureau of Mines,' and there shall be a director of said bureau, who shall be thoroughly equipped for the duties of said office by technical education and experience, and who shall be appointed by the President, by and with the advice and consent of the Senate, and who shall receive a salary of $6,000 per annum; and there shall also be in said bureau such experts and other employees, to be appointed by the Secretary of the Interior, as may be required to carry out the purposes of this act in accordance with the appropriations made from time to time by Congress for such purposes.

"SEC. 2. That it shall be the province and duty of the Bureau of Mines, subject to the approval of the Secretary of the Interior, to conduct inquiries and scientific and technologic investigations concerning mining, and the preparation, treatment, and utilization of mineral substances with a view to improving health conditions and increasing safety, efficiency, economic development, and conserving resources through the prevention of waste in the mining, quarrying, metallurgical, and other mineral industries; to inquire into the economic conditions affecting these industries; to investigate explosives and peat; and on behalf of the Government to investigate the mineral fuels and unfinished mineral products belonging to, or for the use of, the United States, with a view to their most efficient mining, preparation, treatment, and use; and to disseminate information concerning these subjects in such manner as will best carry out the purposes of this act.

"SEC. 3. That the director of said bureau shall prepare and publish, subject to the direction of the Secretary of the Interior, under the appropriations made from time to time by Congress, reports of inquiries and investigations, with appropriate recommendations of the bureau, concerning the nature, causes, and prevention of accidents, and the improvement of conditions, methods, and equipment, with special reference to health, safety, and prevention of waste in the mining, quarrying, metallurgical, and other mineral industries; the use of explosives and electricity, safety methods and appliances, and rescue and first-aid work in said industries; the causes and prevention of mine fires; and other subjects included under the provisions of this act.

"SEC. 4. In conducting inquiries and investigations authorized by this act neither the director nor any member of the Bureau of Mines shall have any personal or private interest in any mine or the products of any mine under investigation, or shall accept employment from any private party for services in the examination of any mine or private mineral property, or issue any report as to the valuation or the management of any mine or other private mineral property: *Provided*, That nothing herein shall be construed as preventing the temporary employment by the Bureau of Mines at a compensation not to exceed $10 per day, in a consulting capacity or in the investigation of special subjects, of any engineer or other expert whose principal professional practice is outside of such employment by said bureau.

"SEC. 5. That for tests or investigations authorized by the Secretary of the Interior under the provisions of this act, other than those performed for the Government of the United States, or State governments within the United States, a reasonable fee covering the necessary expenses shall be charged, according to a schedule prepared by the Director of the Bureau of Mines and approved by the Secretary of the Interior, who shall prescribe rules and regulations under which such tests and investigations may be made. All moneys received from such sources shall be paid into the Treasury to the credit of miscellaneous receipts.

"SEC. 6. That this act shall take effect and be in force on and after its passage."

AUTHORIZATION FOR PUBLISHING REPORTS.

The authority of the bureau for publishing reports is found in the joint resolution (36 Stat., 883) of Congress, approved June 25, 1910, as follows:

That the publications of the Bureau of Mines shall be published in such editions as recommended by the Secretary of the Interior, but not to exceed ten thousand copies for the first edition.

SEC. 2. That whenever the edition of any of the publications of the Bureau of Mines shall have become exhausted and the demand for it continues there shall be published, on the requisition of the Secretary of the Interior, as many additional copies as the Secretary of the Interior may deem necessary to meet the demand.

ACT PROVIDING FOR MINING-EXPERIMENT AND MINE-SAFETY STATIONS.

The act (40 Stat., 969), approved March 3, 1915, which authorizes the Secretary of the Interior to establish and maintain mining-experiment and mine-safety stations under the Bureau of Mines is as follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior is hereby authorized and directed to establish and maintain in the several important mining regions of the United States and the Territory of Alaska, as Congress may appropriate for the necessary employees and other expenses, under the Bureau of Mines and in accordance with the provisions of the act establishing said bureau, ten mining experiment stations and seven mine safety stations, movable or stationary, in addition to those already established, the province and duty of which shall be to make investigations and disseminate information with a view to improving conditions in the mining, quarryng, metallurgical, and other mineral industries, safeguarding life among employees, preventing unnecessary waste of resources, and otherwise contributing to the advancement of these industries: *Provided*, That not more than three mining-experiment stations and mine-safety stations hereinabove authorized shall be established in any one fiscal year under the appropriations made therefor.

SEC. 2. That the Secretary of the Interior is hereby authorized to accept lands, buildings, or other contributions from the several States offering to cooperate in carrying out the purposes of this act.

REPORT OF THE GOVERNMENT HOSPITAL FOR THE INSANE.

OFFICERS OF THE HOSPITAL.

BOARD OF VISITORS.

Brig. Gen. GEO. M. STERNBERG, U. S. A., President of the Board.
Mrs. HENRY G. SHARPE.
Mr. LEWIS E. SMOOT.
Mrs. ARCHIBALD HOPKINS.
Mr. JOHN W. YERKES.
WALTER S. HARBAN, D. D. S.
RUPERT BLUE, M. D., Surgeon General, P. H. S.
Rear Admiral WILLIAM C. BRAISTED, Surgeon General, U. S. N.
Brig. Gen. WILLIAM C. GORGAS, Surgeon General, U. S. A.

Executive Committee of the Board.

Dr. BLUE, Gen. GORGAS, Dr. BRAISTED.

Chaplains.

Rev. C. H. BUTLER.
Rev. W. G. DAVENPORT.
Rev. C. M. BART.
Rev. HUGH T. STEVENSON.
Rev. GEO. M. CUMMINGS.

MEDICAL STAFF.

Superintendent.

WILLIAM A. WHITE, M. D.

First Assistant Physician.

GEO. H. SCHWINN, M. D.

Clinical Director.[2]

Scientific Director.

S. I. FRANZ, A. B., Ph. D., LL. D., M. D.

Clinical Psychiatrist.

EDWARD J. KEMPF, M. D.

Senior Assistant Physicians.

MARY O'MALLEY, M. D.
ALFRED GLASCOCK, M. D.
BERNARD GLUECK, M. D.
JAMES C. HASSALL, M. D.
JOHN E. LIND, M. D.

Assistant Physicians.

JOHN P. H. MURPHY, M. D.
WILLIAM H. HOUGH, M. D.[1]
JOHN A. PFEIFFER, M. D.
ABRAH B. EVARTS, M. D.
FRANCIS M. SHOCKLEY, M. D.
D. G. O'NEIL, M. D.
LOUIS WENDER, M. D.
DENNIS J. MURPHY, M. D.
ANITA A. WILSON, M. D.
FORREST M. HARRISON, M. D.

[1] Resigned.
[2] Position vacant.

Junior Assistant Physicians.

HAGOP DAVIDIAN, M. D.
JOHN R. ERNEST, M. D.
JOSEPH L. GARISS, M. D.
WM. F. RICE, M. D.
JOSEPH NACK, M. D.
MILDRED E. SCHEETZ, M. D.

Medical Internes.

HERMAN G. MAUL, M. D.[1]
WALDO E. PRESTON, M. D.

Military Assignments.

From the Navy.
ROBERT F. SHEEHAN, M. S., M. D., Passed Assistant Surgeon, U. S. N.

From the Army.
THOS. D. WOODSON, M. D., Captain, Medical Corps, U. S. A.

Histopathologist.[2]

Assistant in Psychology.[2]

Visiting Dentist.

A. D. WEAKLEY, D. D. S.

Dental Interne.

NEAL A. HARPER, D. D. S.

Visiting Ophthalmologist.

ARTHUR H. KIMBALL.

Veterinarian.

JOHN P. TURNER, V. D. M.

Steward and Disbursing Agent

MONIE SANGER.

Chief Clerk.

FRANK M. FINOTTI.

Purchasing Agent.

A. E. OFFUTT.

Matron.

H. O'BRIEN.

Chief of Training School.[2]

Miss CORNELIA ALLEN, R. N.[1]

CONSULTING STAFF.

Internal Medicine.

Dr. S. S. ADAMS.
Dr. G. W. COOK.
Dr. STERLING RUFFIN.
Dr. JAMES D. MORGAN.

[1] Resigned.
[2] Position vacant.

General Surgery.

Dr. L. H. TAYLOR.
Dr. G. T. VAUGHAN.
Dr. W. P. CARR.
Dr. CHAS. S. WHITE.
Dr. JAMES F. MITCHELL.

Gynæcology.

Dr. JOSEPH TABER JOHNSON.
Dr. H. L. E. JOHNSON.
Dr. J. W. BOVÉE.
Dr. I. S. STONE.

Ophthalmology.

Dr. D. K. SHUTE.
Dr. W. K. BUTLER.

Laryngology.

Dr. C. W. RICHARDSON.
Dr. J. J. RICHARDSON.
Dr. W. A. WELLS.
Dr. F. T. CHAMBERLAIN.

Genito-urinary Diseases.

Dr. E. F. KING.
Dr. D. PERCY HICKLING.

Medical Zoology.

Dr. C. W. STILES.
Dr. THOMAS A. CLAYTOR.

Dermatology.

Dr. RANDOLPH BRYAN CARMICHAEL.
Dr. H. H. HAZEN.

REPORT OF THE GOVERNMENT HOSPITAL FOR THE INSANE.

WASHINGTON, D. C., *July 1, 1915.*

SIR: The Board of Visitors for the Government Hospital for the Insane have the honor to submit the sixtieth annual report of the hospital, consisting of the report of the superintendent for the fiscal year ended June 30, 1915, and his recommendations.

Respectfully,

GEO. M. STERNBERG,
President of the Board of Visitors.
WM. A. WHITE, M. D.,
Superintendent, Secretary of the Board ex officio.

The SECRETARY OF THE INTERIOR.

REPORT OF THE SUPERINTENDENT.

MOVEMENTS OF POPULATION.

On June 30, 1915, there were remaining in the hospital 3,076 patients, as against 3,062 remaining on June 30, 1914, an increase of 14 patients over the previous year. There were admitted during the year 656 patients. The total number of patients treated during the year was 3,718. The number of discharges during the year, including deaths, was 642. The daily average population was 3,032, as against 3,025 of the previous year, an increase of 7.

Movement of population, fiscal year ended June 30, 1915.

	Male.		Female.		Total.
	White.	Colored.	White.	Colored.	
Remaining June 30, 1914	1,875	392	507	288	3,062
Admitted during the year	365	106	109	76	656
Total number under treatment	2,240	498	616	364	3,718
Discharged:					
Recovered	81	10	16	10	117
Improved	39	11	16	7	73
Unimproved	58	13	15	13	99
Not insane	10	2	1	3	16
Died	208	57	36	36	337
Total	396	93	84	69	642
Remaining June 30, 1915	1,844	405	532	295	3,076

Daily average, male, 2,225; female, 807.50; total, 3,032.50.

ADMINISTRATIVE DEPARTMENT.

OFFICE OF STEWARD AND DISBURSING AGENT.

Farm and garden products raised during the year ended June 30, 1915.

Articles.	Quantity.	Cost.	Articles.	Quantity.	Cost.
Apples:			Forage—Continued.		
Crab ..... bushels..	47	$47.00	Grass ..... tons..	122	$488.00
Green ..... barrels..	222	333.30	Oats, green ..... do....	56	224.00
Beans:			Rye ..... do....	39	156.00
Lima ..... bushels..	86	129.39	Wheat ..... do....	58	232.00
String ..... barrels..	106	255.38	Grapes ..... pounds..	13,285	398.55
Beets ..... bunches..	4,243	127.29	Kale ..... barrels..	203	152.41
Cabbage ..... barrels..	159	198.75	Lettuce ..... heads..	11,701	585.05
Cabbage sprouts ..... do....	31	62.00	Milk ..... gallons..	140,230	28,046.00
Cantaloupes	12,004	600.20	Onions:		
Carrots ..... bunches..	9,949	298.47	Dried ..... barrels..	1	1.20
Celery ..... do....	2,134	106.70	Green ..... bunches..	42,775	1,283.25
Cherries ..... quarts..	330	33.00	Oyster plant ..... do....	1,630	81.50
Chickens ..... pounds..	349	59.44	Parsley ..... do....	15,200	456.00
Corn, green ..... ears..	26,913	269.13	Pears ..... bushels..	346	345.50
Cucumbers	4,170	41.70	Peas, green ..... do....	200	401.00
Currants ..... quarts..	30	3.00	Peppers, green ..... do....	102	152.38
Eggs ..... dozens..	5,121	1,071.36	Parsnips ..... barrels..	103	129.25
Eggplant	3,002	150.10	Plums ..... bushels..	14	21.00
Figs ..... bushels..	3	3.60	Potatoes, Irish ..... do....	454	499.78
Forage:			Pork ..... pounds..	32,627	3,262.70
Clover hay ..... tons..	58	232.00	Pumpkins	2,271	181.68
Corn fodder ..... do....	589	2,945.00	Radishes ..... pounds..	11,803	354.09
Corn, ear ..... barrels..	82	185.12	Spinach ..... barrels..	154	192.63
Corn, shelled .... bushels..	870	733.24	Squash	7,231	216.93
Cowpeas ..... tons..	90	450.00	Tomatoes ..... bushels..	1,174	880.31
Cowpeas and orchard grass ..... tons..	36	144.00	Turnips ..... do....	592	236.80
			Watermelons	319	47.85

Work done in mattress shop during the year ended June 30, 1915.

Mats, drawn-made	110	Pillows:	
Mats, braided-made	95	Hair, made and made over	1,016
Mattresses:		Feather, made and made over	5
Hair, single, made and made over	1,101	Hair, renovated ..... pounds..	26,350
Hair, double, made and made over	7	Clothing repaired ..... pieces..	330
Straw, single, made and made over	44	Socks repaired ..... pair..	243

Work of sewing and mending rooms during the year ended June 30, 1915.

ARTICLES MANUFACTURED.

Articles.	Quantity.	Cost.	Articles.	Quantity.	Cost.
Aprons:			Coats:		
Barber	3	$30.78	Citizens'	1,052	$1,165.16
Dining room	94	18.80	Dairy	44	35.20
Gingham	174	25.40	Dentists'	2	2.40
Rubber	3	2.49	Overall	416	461.42
White	943	139.92	Corner pieces	4	4.56
Bags:			Covers:		
Clothes	27	6.48	Billiard table	2	7.80
Jelly	4	.20	Bureau	296	93.85
Laundry	4	1.24	Car	131	61.54
Bedsides, canvas	10	4.10	Chair	2	4.86
Bids	79	9.48	Couch	17	27.55
Blouses	653	1,866.03	Corset	9	2.53
Caps:			Cushion	6	2.14
Dairy	18	2.34	Piano	1	.58
Rubber	64	10.24	Screen	345	74.04
Cases, pillow:			Sideboard	33	15.84
Cotton	5,316	850.56	Stand	911	241.02
Cotton rep	2	1.04	Table	3	2.46
Linen	6	3.48	Transom	5	2.00
Rubber	5	4.40	Curtains:		
Centerpieces	6	.36	Bookcase	5	1.35
Chemise	1,367	488.96	Cotton	4	2.34
Cloths, table:			Sash	40	10.12
Long	254	685.12	Window, Holland	960	720.00
Short	252	392.89	Window, Swiss	76	113.64

Work of sewing and mending rooms during the year ended June 30, 1915—Continued.

ARTICLES MANUFACTURED—Continued.

Articles.	Quantity.	Cost.	Articles.	Quantity.	Cost.
Drawers:			Sheets:		
Men's canton flannel	2,034	$1,047.96	Double	156	$131.46
Boys' canton flannel	6	2.40	Single	6,645	3,329.08
Men's cotton	6	2.76	Shirts:		
Women's cotton	953	293.40	Canton flannel, boys'	10	4.00
Dresses:			Canton flannel, men's	1,608	912.60
Denim	209	335.56	Check	3,612	1,553.16
Gingham	1,080	1,324.78	Night	976	730.17
Night—			Outing	4	2.36
Long	366	193.61	Shirtwaists, percale	4	4.40
Short	1,042	424.82	Skirts:		
Percale	407	827.23	Denim	7	5.32
Gowns, nurses'	25	16.71	Gingham	10	5.03
Jackets, boys'	1	1.12	Strainers, linen	28	16.24
Mittens, pairs	12	.72	Suits, canvas	30	45.60
Napkins, sanitary	429	41.38	Ticks:		
Pants:			Mattress, double	4	6.83
Boys'	18	5.94	Mattress, single	551	534.47
Citizens'	1,632	1,360.20	Pillow	300	72.00
Dairy	44	35.20	Towels:		
Outing	4	1.96	Balmsley	451	45.10
Overall	667	557.33	Bath	2,684	322.08
Soldiers'	617	1,749.19	Tea	2,658	318.96
Petticoats:			Tubs, canvas bath	3	14.25
Cotton	1,374	697.86	Vests, citizens'	228	107.28
Outing	3	1.29	Waists, boys'	9	2.34
Sacques, dressing	1	1.64			

REPAIR AND MISCELLANEOUS WORK.

Aprons made (labor only)	329	$19.74	Suits cleaned and pressed	140	$33.62
Bags, clothes (labor only)	21	.84	Ticks, mattress, made (labor only)	8	.96
Bags, laundry (labor only)	431	17.24	Towels made	158	.....
Blankets hemmed	892	31.22	Towels hemmed	32	.....
Gloves made (labor only)	472	18.88	Articles repaired, miscellaneous, pieces	37,822	1,520.88
Names sewed on	10,945	34.58			
Napkins hemmed	1,632	.....			
Sheets, mangle, made (labor only)	25	.75			

ARTICLES MADE FOR PATIENTS FROM FURNISHED MATERIALS.

Aprons	16	$0.96	Dresses	13	$12.35
Drawers	6	.96	Shirt waists	6	3.84

Output of the bakery during the year ended June 30, 1915.

Articles.	Quantity.	Cost.	Articles.	Quantity.	Cost.
Buns, single	19,602	$80.90	Doughnuts, single	37,860	$143.11
Bread:			Pies (dough only)	40,869	1,365.02
Ginger, pounds	11,178	271.77	Pudding:		
Graham, loaves	18,084	417.40	Bread (baking only), lots	6	1.50
Wheat, do	904,812	20,764.61	Cottage, pounds	3,378	190.77
Cake:			Rolls:		
Apple, pounds	110	3.45	Finger, single	276	1.10
Coffee, do	4,715	164.00	French, do	1,190	4.91
Fruit, do	828	69.45	Morning, do	2,331,124	8,918.01
Marble, do	1,122	62.98	Turkeys roasted, do	100	2.55
Plain, do	29,320	1,643.18			

Work of harness and shoe maker during the year ended June 30, 1915.

NEW WORK.

Articles.	Quantity.	Cost.	Articles.	Quantity.	Cost.
Breechings	4	$16.57	Straps:		
Cases, chain, for automobile	1	7.52	Breeching	3	$3.54
Harness, pieces	54	.....	Wrist	1	.25
Lines, cart, pair	3	6.91	Strops, razor	2	1.48

ARTICLES REPAIRED.

Bags, tool	1	Harness, pieces	498
Boots, pairs	9	Do, sets	13
Balls, medicine	1	Shoes, pairs	922
Cuffs:		Straps:	
Broom sewing, pairs	3	Restraining	7
Hand, do	2	Kicking	1
Gloves, boxing, do	9		

Articles made in the tin shop during the year ended June 30, 1915.

NEW WORK.

Articles.	Quantity.	Cost.	Articles.	Quantity.	Cost.
Boilers	38	$69.68	Forms, cement	10	$14.43
Boards, flue	1	2.01	Flange and tube	1	4.97
Boxes:			Floats, tank	1	.28
Key	4	6.37	Funnels for wells	2	7.83
Steam	1	35.84	Guards:		
Food	88	103.68	Oil for power house		18.14
Bread	1	3.70	Wheel	1	1.70
Soup	6	1.28	Lugs, pan		2.43
Knife	2	3.63	Measures	1	.68
Barber	1	2.90	Molds, ice		3.91
Buckets	15	19.52	Molds	48	7.23
Milk	40	59.65	Pans:		
Sugar	15	16.92	Commode	25	30.23
Cans:			Drip	15	13.44
Milk	17	2.57	Dish, large	4	11.98
Sterilizing	1	3.96	Roasting	13	14.54
Strup	5	5.87	Oil	2	3.00
Fumigating	1	2.10	Drip for ice plant	1	15.86
Oil	4	2.34	Pots:		
Crates, meat	12	43.37	Glue	1	1.10
Covers:			Watering	1	1.86
Boiler	6	6.41	Pipe for silo	1	.78
Food-box	13	8.88	Pumps	1	4.50
Coffeepot	36	7.96	Rings for coffee urn	2	.24
Carriers, food	8	36.14	Smokestacks	1	9.63
Caps, chimney	1	3.52	Skylight for piggeries		12.30
Caps	6	.97	Strainers	1	.25
Casings, pipe		4.72	Steamers, coffee	2	20.22
Crates, potato	12	21.09	Scoops	1	.67
Doors, fireproof	1	18.82	Tureens, soup	12	10.17
Elbows	1	1.38	Tins, census	3	3.22

ARTICLES REPAIRED.

[All necessary repairing of roofs, gutters, ventilators, window and porch guards, ranges, and stoves.]

Boxes:		Pots, fire	1
Trash	2	Pumps	1
Clothes	3	Pumps, oil	1
Ice	2	Pasteurizers	1
Cabinets, filing	2	Plugs	8
Chairs, wheel	1	Refrigerators	15
Closets, warming	1	Sprinklers	3
Doors, fireproof	1	Tables:	
Elevators	2	Bedside	50
Exhausts, steam	1	Steam	1
Freezers, ice cream	1	Tanks	7
Fireplaces	1	Tubes, speaking	2
Lanterns	1	Urns, coffee	2
Lubricators	1	Washers	2
Mixers, bath	1	Ware (miscellaneous)	791
Pipes, heater	1	Whistles	2

Work done by photographer during year ended June 30, 1915.

Photographs taken (patients)	698	Lantern-slide plates made	34
Photographs taken (administrative)	19	X-ray photographs taken	2
Prints made (patients)	709	Total photographs taken	753
Prints made (administrative)	59	Total prints made	768

Work done by coach painter during year ended June 30, 1915.

Vehicles painted or repaired	46	Pumps, stationary, painted	3
Engines, stationary, painted	2		

Work done by wheelwright during year ended June 30, 1915.

NEW WORK.

Articles.	Quantity.	Cost.	Articles.	Quantity.	Cost.
Boxes:			Mauls	4	$7.59
Starting	1	$3.97	Singletrees	3	2.49
Tool	1	.65	Tools sharpened	395	194.55
Bodies, slat, for wagon	1	17.36	Tools, miscellaneous	10	.....
Doubletrees	1	1.15	Tongues, wagon	2	4.06
Handles, jack	2	1.81	Trestles	2	4.13
Handles replaced	178	51.62	Tops for water coolers	2	4.69
Lawn mowers sharpened	56	54.05			

ARTICLES REPAIRED.

Baskets:		Mowers:	
Bread	11	McCormick	11
Clothes	24	Lawn	1
Cars, dump	2	Peels, oven	4
Chairs, wheel	5	Planters, corn	1
Choppers, food	1	Plows	1
Cultivators	3	Rollers	1
Freezers, ice cream	1	Stepladders	1
Harrows	1	Trucks	34
Irons, soldering	1	Tubs	6
Ladders	2	Wheelbarrows	26

In addition to the above, all necessary repairs were made to wagons, carts, carriages, and buggies.

Work done in Howard Hall workroom during year ended June 30, 1915.

Articles.	Quantity.	Cost.	Articles.	Quantity.	Cost.
New work:			Repair work:		
Brooms made	1,790	$405.73	Coats	781	.....
Brooms, whisk, made	48	4.48	Drawers	771	.....
Chairs recaned	95	.....	Pants	1,088	.....
Chairs, rocking, recaned	.....	.....	Shirts	780	.....
			Undershirts	122	.....

Work done in blacksmith and horseshoeing department, year ended June 30, 1915.

All necessary repairs on wagons, carriages, pushcarts, wheelbarrows, farm implements and machinery, horseshoeing; also sharpening, repair, new and miscellaneous work, as follows:

NEW WORK.

Articles.	Quantity.	Cost.	Articles.	Quantity.	Cost.
Awls and needles	4	$0.71	Irons:		
Bars, slice	13	20.80	Angle	361	$20.34
Bands, pipe	30	6.90	For food cars	2	4.97
Bolts:			For hotbed sash	25	5.39
Eye (labor)	10	4.33	For meat pans	.....	7.55
Assorted	78	7.80	Ironwork and tie-rods for stable gates	.....	10.00
Clamps:			Knives	2	.74
Assorted	180	21.66	Links, grate (labor)	20	4.33
Beam (labor)	48	5.27	New shoes put on and old ones repaired	[1] 1,521 [2] 306	556.67
Cleaners, joint	3	.36	Plates, door	12	8.14
Dressing tools	741	174.13	Racks, pipe (labor)	12	24.19
Drill castings for new piggeries	.....	20.94	Scrapers, floor	4	.75
Drilling and bending angle iron	.....	25.88	Stakes	1	.39
Hangers	25	18.31	Straps, pipe	24	2.26
Hoes, fire and ash	24	35.04	Supports, pipe coil	68	10.83
Holders, snow guard	5	2.92	Tools (small miscellaneous)	119	.....
Hooks and rings for 3 log chains	.....	4.51	Work on remodeling dining room	.....	14.08
			Wrenches	4	3.60

[1] Old. [2] New.

east side of Nichols Avenue; also one in the hall of the old Center Building on the west side. Blue prints have been prepared showing the location of various roads, hydrants, and buildings and copies furnished to the authorities of the District for the use of their fire department. Lists have been prepared of the location of various Save-All fire escapes, and copies of these furnished to the District authorities for their official use and guidance.

Sewers.—We received a letter from the sewer department of the District of Columbia calling our attention to the fact that where our sewers empty into the District outlet sewers the material is unscreened and stating that it would be necessary to make some change, recommending that settling basins and the necessary screens be built. We at once considered the feasibility of putting this recommendation into effect, taking into consideration the further note made by them that several of our sewers were not connected with their system and emptied into the ravine below the hospital grounds. We outlined a plan for connecting up the sewers that were emptying into the ravine and continuing the various sewer lines down to the out-fall sewers of the District. This work has been completed, settling basins and screens installed, and the sewage capacity of the institution increased. This should improve the sanitary conditions surrounding this portion of the institution. In connection with the new piggery and the plan for the sewage-disposal plant to prevent the sewage from going into Stickfoot Creek, it was thought advisable to change our method of draining the kitchens of the Richardson group. Accordingly the pipes draining these kitchens were connected with the sewers of the hospital. Sewer pipes are at present being laid connecting the Dodge and Green cottages with our sewer system. Both these cottages have had dry closets, and we considered them a nuisance and a possible menace to health; therefore, they were changed into closets with running water and connected with out sewers. Sewers have also been laid connecting with the tubercular cottages.

Public comfort station.—A public comfort station has been built adjacent to the north gate for the benefit of the residents of the hospital reservation and the visitors.

Remodeling old bakery.—The old bakery next to the general kitchen has been reconstructed, the floor, walls, and ceiling being torn out and remodeled. It is to be used as a dining room for employees. The walls and ceiling have been replastered and the floors tiled. This will permit the reclassification of those employees now eating in the general dining room and the attendants' west-side dining room.

Detached dining hall.—The large congregate dining hall for patients in the detached group of buildings is at present being remodeled, substituting tile floor and wainscoting for wood and plaster. This dining hall is a large room, seating approximately 500 patients. In the endeavor to keep this room sanitary it has been necessary to be continually mopping and scrubbing, and there has always been, in consequence, an odor of damp wood. It is believed that this change from a wooden floor to a tile floor will make it easier to keep it clean and leave it at all times in a sweet and sanitary condition, at the same time doing away with this objectionable odor and making it a more agreeable place in which to eat.

put in place in the entrance way before this entire work has been completed. The inclosure has been graded, concrete walks laid out, and tool-proof guards put over the basement windows. An iron door has been ordered to be installed in the tunnel in the entrance and an exhaust fan put in place to properly ventilate this tunnel. This portion of the tunnel will then be used for the watchman's house, and all keys for the various doors and gates to any portion of Howard Hall will be taken by the watchman from those who enter, to be returned when they leave. No one can leave the buildin9 or inclosure until the watchman is notified, as he must open the door from his side after carefully observing who demands the exit and seeing that it is proper to permit the parties to pass out. This will undoubtedly minimize to a great extent the possibility of the escape of patients from within this inclosure, and the chances of escaping being so small, the incentive looking toward the attack of an employee with that end in view is removed. This will thus have a tendency to improve the conditions in reference to the conduct of patients in this matter. The wall inclosing the criminal building is 24 feet high and 1,200 feet long, surrounding a courtyard some distance from the building itself. This wall is built at a distance of approximately 50 feet from the building and does not, therefore, shut out air or sunlight. Previous to the building of the wall the only place the men had to take exercise was an inside court, which was paved with bricks and which became tremendously heated during the summer months and made of the courtyard a veritable oven. It is contemplated that the inclosure provided by the wall will offer a very great relief to the population of this building and permit in general greater freedom for this class of patients.

New piggery.—The new piggery is completed and will require practically no additional labor and material before being used; in fact, arrangements are at present under way looking toward the transfer of the herd of hogs and pigs from the present location to the new one. The new piggery is located on the road to the cemetery, several hundred yards in the rear of the Richardson group of buildings, and is large enough to hold 600 pigs. This should be a decided advantage to the hospital from an economical standpoint, for there is nothing that pays so well for an institution of this sort as a herd of hogs. The piggery is of a kind that can easily be cleaned, it is largely of cement construction, and can be, therefore, kept in a sanitary condition, and the hospital should receive quite an increase in the quantity of home-raised pork during the next few years. We have on hand at the present time 210 hogs and received from this department during the past year 32,627 pounds of pork.

We had a few hogs that showed symptoms of hog cholera during the month of March and a fresh outbreak during the month of June, and it became necessary to destroy some of the younger ones. The hospital veterinary, in conjunction with representatives from the Department of Agriculture, immunized the balance with hog-cholera serum. During the last outbreak the serum used was that known as double strength, the effects of which is said to last during the life of the animal. The veterinary recommends that these hogs be removed to the new pens as soon as possible, and his recommendation will be carried out; but he requests to be notified a day or two in advance of such removal, so that an examination may be made and the tem-

were communicated with and after an inspection recommended a thorough overhauling. A contract was made with them to go carefully over the whole machine, its outlets and burners, and put it in repair, replacing worn-out parts. This has been done, and the machine is now giving much better service than it has for several years past and using a smaller quantity of gasoline.

Sleeping quarters over stables.—The rooms over the stable, on the south end used by the dairy and farm employees and on the north end by the colored employees for sleeping quarters, upon investigation proved to be in poor repair, crowded, and with very poor lavatory and closet accommodations. The wall was cut through on the north end, additional accommodations built for the colored employees, a water section installed containing shower baths, the floor tiled, and the old section in the north and south end fitted with shower baths and tiled water sections. All these new equipments are the most modern and should add materially to the sanitary condition of these quarters and increase the comfort of the employees.

Painting.—The following wards and rooms have been painted:

Sycamore.—Painted walls, ceilings, and varnished woodwork.

Home 1.—Painted walls, ceilings, and varnished woodwork.

Home 2.—Painted walls, ceilings, and varnished woodwork.

Home 3.—Painted walls, ceilings, and varnished woodwork.

Home 4.—Painted walls, ceilings, and varnished woodwork.

Home building.—Painted one stairway.

Center building, second floor.—Painted walls, ceilings, and varnished woodwork in two rooms, also varnished floors in dining room and hall, and varnished floor on stairway from first to second floor.

Sewing room.—Varnished all woodwork, floors, and counters.

Q Building.—Painted walls, ceilings, and varnished woodwork in five rooms. Toilet rooms in Q–3 and Q–4 painted.

A Building.—Painted walls, ceilings, and varnished woodwork in 7 rooms, 3 small halls, 2 closets, and 2 bathrooms.

B Building.—Painted walls, ceilings, and varnished woodwork in three rooms, bathrooms, two closets, dormitory, toilets, small hall, alcoves, and clothes room.

R Building.—Painted walls, ceilings, and varnished woodwork in baths and toilets in R–1, R–2, R–3, R–4, and dining rooms and pantries in R–1 and R–2.

Retreat.—Painted walls, ceilings, and varnished woodwork in dining room of Retreat 1 and 2. Painted walls and varnished woodwork in water section.

Poplar.—Painted walls, stage, and varnished floor in billiard room.

Milk room.—Painted and glazed the milk room. Painted and glazed the watchman's house.

M Building.—Painted walls, ceilings, and varnished woodwork in dining room.

Nurses' Home.—Painted walls, ceilings, and varnished woodwork in two rooms.

West Lodge.—Painted walls and woodwork in three rooms in West Lodge 1. Painted walls and varnished woodwork in water section in West Lodge 2.

C Building.—Painted walls, ceilings, and varnished woodwork in two rooms.

Pathological Building.—Painted exterior and interior, with exception of autopsy room.

Toner Building.—Painted walls, ceilings, and varnished woodwork in two rooms in Toner 1, and touched up wall in hall.

Cypress.—Painted walls, ceilings, and varnished woodwork and stained and varnished floors in Cypress and Elm wards, also two reception rooms.

White Ash.—Painted walls and varnished woodwork in water section.

Garfield.—Painted walls, ceilings, and varnished woodwork in dining rooms of Garfield 1 and Garfield 2 and Beech ward.

Howard Hall.—Painted walls, ceilings, and varnished woodwork in one room in Howard Hall.

Laundry.—Painted stairway in laundry, also stairway leading from Elm to Spruce, and stairway in Relief ward.

Meat Room.—Painted woodwork and walls.

Stable.—Painted woodwork in sleeping quarters.

In addition to the foregoing, various rooms, porches, and portions of buildings have been painted, windows and doors screened, roofing tin painted, radiators bronzed, and other painting and glazing done that was necessary to the institution.

New floors.—New floors have been laid in Toner Building, Dawes Building, some of the buildings of the Richardson group, Hitchcock Hall, and others repaired where it was found necessary throughout the institution.

Screens.—New screens have been placed in various buildings where it was found desirable and the screen doors and windows kept in repair.

Library.—Several hundred new books have been purchased for the patients' library, and the circulation continues to increase. At the present time there are approximately 1,000 books in continuous circulation among the patient population.

Entertainments.—Moving pictures form the main means of entertainment for the patients during the winter season. A new machine has been ordered to take the place of the one in use. In addition to the moving pictures there is a dance in the amusement hall every Tuesday night during the winter season. There is a concert by the band in some portion of the grounds on Tuesdays and Fridays during the summer season.

Broom-making machinery.—New broom-making machinery has been purchased and installed in the basement of Howard Hall department, where a workroom was established in November. Since this machine has been installed and this workroom established all the brooms and whisk brooms used on the place have been made. We have set aside a portion of the farm land to plant broom corn, and hope that in a short period we will be able to raise all the corn needed for the manufacture of brooms and whisk brooms.

Roofs.—We are continuing our practice of replacing old roofs by putting on new roofs in various portions of the old Center Building. We have purchased the necessary tin to continue this practice and expect in another year the whole of the old building will have been overhauled and new roofs put in place.

Railway.—The locomotive continues in good condition, handling about 800 cars during the year. We have replaced about 800 ties

along the railroad, and the track has been resurfaced a good portion of the way. A change in the roadbed is contemplated during the present year, it being decided to move the tracks to a safer location on account of the slides, and at the same time to eliminate the compound curve of the tracks.

Wooden aqueducts.—The old wooden aqueducts back of the power house and south of the old boiler house, which formerly carried all steam and hot-water pipes and electric wires connecting the power house with the various buildings, and which have been looked upon as a menace to the institution for many years, highly inflammable and in a dangerous condition, have been abandoned and torn down. The pipes and wires in these aqueducts have been transferred to concrete tunnels in connection with the remodeling of the power, heating, and lighting plant.

Furniture and rugs.—New furniture and rugs have been purchased for various places about the institution and linoleum for the floor of the hall in Poplar ward.

Memorial Day services.—The services on Memorial Day were generally observed, there being a large number of visitors present to assist the patients and employees in celebrating the day. On the Sunday preceding the 30th of May services were held in Hitchcock Hall on account of the threatening condition of the weather. As it rained during the morning it was thought to be inadvisable to hold the services outside. On the morning of this day the graves in the cemetery were decorated, this being done by representatives of the Spanish-American War veterans and their assistants, together with the assistance of employees of the hospital.

Cost system.—In carrying out the suggestion of one of the members of the Board of Visitors in reference to installing a relative cost system, conference has been held with a representative of the Efficiency Division of the Civil Service Commission, who officially reported that he had drawn up a plan, which has been adopted by the Secretary of the Interior and put in process of installation. Blanks have been drawn up and submitted to the Comptroller of the Treasury, through the Interior Department, for his approval previous to printing. A contract has been entered into with a meter company for furnishing and installing measuring devices in connection with the power, heating, and lighting system. As soon as the forms have been printed and furnished we will notify the Efficiency Division of the Civil Service Commission, and they will send some of their representatives to the hospital for the purpose of assisting in installing the system. With this assistance we will be enabled to put into effect, it is hoped, at an early period a complete cost system, carrying out the general scheme that we began some years ago of gradually creating a cost system affecting the various branches of the hospital. We believe that when this cost system has been put in working order we will have a first-class accounting system in every way.

Fiduciary relations with the District of Columbia.—We are pleased to report that the District of Columbia have been very prompt in paying their board bill during the past year, and this has expedited the settlement of the claims against the hospital and prevented the inconvenience which existed to such a great extent during previous years. All vouchers received in this office have been promptly settled, and all supplies ordered were furnished in good time.

All accounts of the disbursing officer transmitted to the auditor must now pass through the chief clerk's office and receive his administrative approval before being transmitted through the Interior Department to the auditor. The accounts for the various quarters have been transmitted in proper time, and reports received from the auditor through the account for the period ending March 31, this year. There are no items through that period to which the auditor has taken exception or has suspended which have not been properly explained and afterwards passed.

Accountant of House Committee on District of Columbia.—The House Committee on the District of Columbia, which has been investigating the account between the Government Hospital for the Insane and the District of Columbia, and accounts for the support, clothing, and medical treatment of patients admitted from the District of Columbia to the Government Hospital for the Insane, have completed their work and made report. In this report they state that there is a balance due the United States from the District of Columbia for the fiscal years 1879 to 1912, inclusive, on account of unpaid board of $282,754.26; for interest on unpaid balances, $203,470.01; total due the United States, $486,524.27. (See H. Doc. No. 1628, 63d Cong., 3d sess.)

Reclaimed land.—Much of the land that has been reclaimed by the War Department adjacent to the hospital property appears to have been drained to such an extent that it could be used for farming. A portion of this land has been leased by the War Department to certain parties who are now in possession. It would seem that the interests of the Government would be best conserved by the transfer of this land from the War Department to the Interior Department and the hospital be given permission to cultivate and utilize this land for their interests. A recommendation is included in our estimates asking Congress to make this change.

Leonard Rook safety valve.—Safety valves have been installed in connection with the shower bath in the west lodge ward and the continuous baths in C building. These have been tried for several months and are apparently giving satisfaction. They are arranged in such a manner that the hot water can not be turned on until the cold water is turned on. They are set to a certain temperature, and as soon as the water reaches that temperature the cold water is supposed to enter the pipes and prevent the water from becoming heated to a greater extent. This minimizes the danger of scalding. As soon as a satisfactory test has been given this or similar valve, additional ones will be purchased and installed in all places where there is this possibility of an accident.

Water-closet.—A new class water-closet has been purchased, one which is flushed by means of a valve without a tank. By this means the number of parts is minimized and the possibility of wear and tear lessened and the cost of upkeep reduced. This has been in use a few months and so far has apparently served its purpose. If it proves entirely satisfactory after sufficient time has elapsed in which a fair test can be made, we will probably purchase additional closets of this class and install them where needed.

Change name of hospital.—It is recommended that additional legislation be secured looking toward the change of the name of this insti-

approximately $22,000 for this material. In compliance with an act of Congress $11,950 of this amount was added to the appropriations previously made by Congress for the centralizing of the power, heat, and lighting plants and for other purposes, the balance being used toward augmenting appropriations made for the support of the hospital, in compliance with another act permitting us to use the receipts from useless and waste material.

Automatic stokers, coal and ash handling machinery.—Contracts have been awarded looking toward the installation of automatic stokers, coal and ash conveyors, soot blowers, and other mechanical devices. When this work is completed this will terminate the work begun in 1909 of remodeling the power, heating, and lighting layout of the institution. A complete change has been made of the power in use from direct to alternating current, most of the buildings have been rewired, all the old wires have been withdrawn from the tunnels, new conduits laid and the wires placed therein, the old boiler house abandoned, the separate boiler house for the pumping plant will soon be dismantled and the pumps connected with the central power plant.

Wells and water supply.—The nine wells from which we receive our water that is used for drinking and all other purposes are being overhauled and cleaned. Several of these wells were in very bad condition, and the supply of water has been materially increased as a result of the present renovation. Our water supply at all times has been plentiful, and even in the warmest weather we had plenty of water. During a portion of this time, however, it has been necessary to depend upon one pump, and this was pushed to its maximum capacity. As soon as the new air compressors are installed there should be no further danger of this sort, as we have not only an ample supply of water from the wells, but being connected with the District water supply, in case of an emergency we could always secure any amount that would be needed for the use of the hospital.

New pumps have been ordered in connection with the remodeling of the water plant to pump the river water up to the hospital pond to be used for such purposes as hydraulic elevators. The quantity of fuel used in securing our water supply has materially decreased during the past few years.

Ice and refrigeration plant.—Our ice plant has proved inadequate to meet the great demand upon it in the summer time for ice, and to remedy this in part we have remodeled the brine tanks, renewed the brine pipe line to the cold-storage room, and installed centrifugal pumps for brine circulation in the tanks and to the cold-storage rooms. The ammonia compressors have been overhauled and new parts purchased to replace worn-out portions of these machines, but the fact must be taken into consideration that the present machines have been in existence many years and have not kept pace with the growth of the institution. We have at present 2 Remington machines, with a capacity of 6 tons each, which have been in use 15 years, and 1 York machine, with a capacity of 20 tons, which has been in use 10 years. The capacity of the present plant is approximately 6 tons of ice a day and 12 tons of cold storage or refrigeration. While the rating capacity is 32 tons, yet on account of the condition of the machines it is impossible to secure a greater capacity than 18 tons, as stated. During the present warm season we are continuously

being threatened with a breakdown in the machinery on account of the necessity of running the engines at top speed, and the cost of maintenance is a good deal higher than it should be, due to these conditions. It is necessary to keep all of our machines in continuous operation during the warm weather, and in the event of a breakdown, which occurs frequently on account of the worn condition of the many parts due to long and strenuous service, the service would be crippled.

Heating.—New radiators have been placed in buildings Q, E, and P, and these buildings will hereafter be heated by direct radiation, instead of indirect radiation as formerly, through fan coils placed in the basement. The radiators in the detached dining hall have been removed and installed in P Building, and steam coils have been placed in position on the walls in various places in the dining hall. The fan coils in the basement of A Building have been reconstructed and encased in galvanized iron. The amount of radiation secured has been tripled and better results have been obtained. Additional radiators have been purchased for buildings I, N, J, K, L, West Lodge, and Howard Hall. The heating of the carpenter shop and many buildings has been remodeled and warming closets installed in the tubercular cottages and in Howard Hall dining rooms 1 and 2.

Fire protection.—The high-pressure fire-service lines were extended within the inclosure of the wall around Howard Hall, four fire hydrants being installed. Further extensions were made of the fire line to the new piggery, where one fire hydrant was installed. We have just installed 17 automatic fire escapes known as the Save-All, which are composed of steel ropes working on copper gears, and appear to be good accessories for certain portions of the institution where we have open windows. Additional fire hose has been ordered and lines placed in distant portions of the institution, connected by standpipes, to be ready in an emergency.

We believe the hospital is at present equipped to attack a fire in its incipient stage and to prevent a spread to a great deal better extent than it ever has been heretofore. We have a high-pressure water system, and a hose attached to the various hydrants on this system will have the same force as if from a fire engine. Water is pumped into this line by Underwriter fire pumps, the water coming from the nozzle at 100 pounds pressure. We also have a second-size fire engine and ample hose for all ordinary needs. Fire extinguishers have been placed in various places throughout the buildings, and fire escapes placed wherever it is thought necessary. Fire doors and fire walls are in many of the buildings, and we employ a chief for the fire department, who regularly inspects every portion of the buildings to see that no trash accumulates and that the various fire apparatus is kept in good condition and are always ready for use. Fire drills are regularly conducted and employees continually informed by notices as well as rules in their rule books what to do and how to act in case of a fire.

In response to suggestions by representatives of the District of Columbia fire department, additional fire-alarm boxes, connected with the city system, have been installed to expedite the summoning of the city department in case they are needed, and localizing the turning in of alarms to secure more prompt service. One of these boxes has been placed in P Building and one in the stable on the

east side of Nichols Avenue; also one in the hall of the old Center Building on the west side. Blue prints have been prepared showing the location of various roads, hydrants, and buildings and copies furnished to the authorities of the District for the use of their fire department. Lists have been prepared of the location of various Save-All fire escapes, and copies of these furnished to the District authorities for their official use and guidance.

Sewers.—We received a letter from the sewer department of the District of Columbia calling our attention to the fact that where our sewers empty into the District outlet sewers the material is unscreened and stating that it would be necessary to make some change, recommending that settling basins and the necessary screens be built. We at once considered the feasibility of putting this recommendation into effect, taking into consideration the further note made by them that several of our sewers were not connected with their system and emptied into the ravine below the hospital grounds. We outlined a plan for connecting up the sewers that were emptying into the ravine and continuing the various sewer lines down to the out-fall sewers of the District. This work has been completed, settling basins and screens installed, and the sewage capacity of the institution increased. This should improve the sanitary conditions surrounding this portion of the institution. In connection with the new piggery and the plan for the sewage-disposal plant to prevent the sewage from going into Stickfoot Creek, it was thought advisable to change our method of draining the kitchens of the Richardson group. Accordingly the pipes draining these kitchens were connected with the sewers of the hospital. Sewer pipes are at present being laid connecting the Dodge and Green cottages with our sewer system. Both these cottages have had dry closets, and we considered them a nuisance and a possible menace to health; therefore, they were changed into closets with running water and connected with out sewers. Sewers have also been laid connecting with the tubercular cottages.

Public comfort station.—A public comfort station has been built adjacent to the north gate for the benefit of the residents of the hospital reservation and the visitors.

Remodeling old bakery.—The old bakery next to the general kitchen has been reconstructed, the floor, walls, and ceiling being torn out and remodeled. It is to be used as a dining room for employees. The walls and ceiling have been replastered and the floors tiled. This will permit the reclassification of those employees now eating in the general dining room and the attendants' west-side dining room.

Detached dining hall.—The large congregate dining hall for patients in the detached group of buildings is at present being remodeled, substituting tile floor and wainscoting for wood and plaster. This dining hall is a large room, seating approximately 500 patients. In the endeavor to keep this room sanitary it has been necessary to be continually mopping and scrubbing, and there has always been, in consequence, an odor of damp wood. It is believed that this change from a wooden floor to a tile floor will make it easier to keep it clean and leave it at all times in a sweet and sanitary condition, at the same time doing away with this objectionable odor and making it a more agreeable place in which to eat.

Floor in Hitchcock Hall.—A new floor has been laid in the auditorium of the amusement hall. This floor had to be replaced, as the old one was badly rotted.

Fence around cemetery.—Posts have been put up and wire fence placed in position around the cemetery. There was formerly an old wooden fence about this portion of the reservation, which had become rotten and fallen down in many places. Under the health regulations of the District of Columbia cemeteries must be inclosed, and in compliance with this regulation a new fence was erected to replace the worn-out one.

New windows.—In constructing some of the old buildings to prevent the possibility of the escape of patients the window sashes and frames were made of iron and installed in such a manner that they could be raised only from 3 to 4 inches. While this served the purpose of preventing anyone from escaping, the frames being all iron and the size of the glass in the frames from 4 to 6 inches, yet from the standpoint of sanitation and comfort, especially in the summer time, it was very unsatisfactory. Looking toward the comfort of the patients, it was decided that some change should be made in the wards where these conditions existed, and orders were given to take out the glass in all of these various frames, permit the iron frames to stay in place to be used as guards, and new wooden sashes and frames be added in place of the other frames, which could be raised and lowered full height, thus increasing the ventilation and sanitation without decreasing the protection and possibility of escape. This work has been completed in Gray Ash and White Ash wards and in West Lodge Building.

Laundry—Flat-work ironers.—A report was received from the manufacturer of the flat-work ironers in use in the laundry calling attention to the fact that these machines had been in use such a length of time that the cylinders had begun to crystallize and that in their opinion they were no longer safe for such use as they were receiving. They notified us that machines of this class were at present being made with improved safety devices attached, minimizing the possibility of accident. The machines on hand were disposed of to the contractor and new ones purchased to replace them. These machines have now been in use for some time and give much better service, and, as stated, on account of the various safety devices attached, minimize the possibility of accidents. They are controlled by a safety device that shuts down if a finger or hand of a worker comes in contact with the rollers.

Safety covers on extractors.—Safety covers were also purchased for the various extractors, preventing these machines from being used except when the covers are closed, thus lessening the possibility of an accident.

Starch extractor.—The starch extractor in use in this department was of an antiquated type of a class dangerous to employees who worked with it. This has been replaced by a new one with modern improvements, including an automatic device to prevent the machine from moving until the cover is closed.

Gas machine.—The machine by which gas is manufactured for heating the rollers of the ironing machines was found to be in bad condition; there was found to be a great waste of gas and it seemed impossible for our mechanic to keep it in repair. The manufacturers

were communicated with and after an inspection recommended a thorough overhauling. A contract was made with them to go carefully over the whole machine, its outlets and burners, and put it in repair, replacing worn-out parts. This has been done, and the machine is now giving much better service than it has for several years past and using a smaller quantity of gasoline.

Sleeping quarters over stables.—The rooms over the stable, on the south end used by the dairy and farm employees and on the north end by the colored employees for sleeping quarters, upon investigation proved to be in poor repair, crowded, and with very poor lavatory and closet accommodations. The wall was cut through on the north end, additional accommodations built for the colored employees, a water section installed containing shower baths, the floor tiled, and the old section in the north and south end fitted with shower baths and tiled water sections. All these new equipments are the most modern and should add materially to the sanitary condition of these quarters and increase the comfort of the employees.

Painting.—The following wards and rooms have been painted:

Sycamore.—Painted walls, ceilings, and varnished woodwork.

Home 1.—Painted walls, ceilings, and varnished woodwork.

Home 2.—Painted walls, ceilings, and varnished woodwork.

Home 3.—Painted walls, ceilings, and varnished woodwork.

Home 4.—Painted walls, ceilings, and varnished woodwork.

Home building.—Painted one stairway.

Center building, second floor.—Painted walls, ceilings, and varnished woodwork in two rooms, also varnished floors in dining room and hall, and varnished floor on stairway from first to second floor.

Sewing room.—Varnished all woodwork, floors, and counters.

Q Building.—Painted walls, ceilings, and varnished woodwork in five rooms. Toilet rooms in Q–3 and Q–4 painted.

A Building.—Painted walls, ceilings, and varnished woodwork in 7 rooms, 3 small halls, 2 closets, and 2 bathrooms.

B Building.—Painted walls, ceilings, and varnished woodwork in three rooms, bathrooms, two closets, dormitory, toilets, small hall, alcoves, and clothes room.

R Building.—Painted walls, ceilings, and varnished woodwork in baths and toilets in R–1, R–2, R–3, R–4, and dining rooms and pantries in R–1 and R–2.

Retreat.—Painted walls, ceilings, and varnished woodwork in dining room of Retreat 1 and 2. Painted walls and varnished woodwork in water section.

Poplar.—Painted walls, stage, and varnished floor in billiard room.

Milk room.—Painted and glazed the milk room. Painted and glazed the watchman's house.

M Building.—Painted walls, ceilings, and varnished woodwork in dining room.

Nurses' Home.—Painted walls, ceilings, and varnished woodwork in two rooms.

West Lodge.—Painted walls and woodwork in three rooms in West Lodge 1. Painted walls and varnished woodwork in water section in West Lodge 2.

C Building.—Painted walls, ceilings, and varnished woodwork in two rooms.

Pathological Building.—Painted exterior and interior, with exception of autopsy room.

Toner Building.—Painted walls, ceilings, and varnished woodwork in two rooms in Toner 1, and touched up wall in hall.

Cypress.—Painted walls, ceilings, and varnished woodwork and stained and varnished floors in Cypress and Elm wards, also two reception rooms.

White Ash.—Painted walls and varnished woodwork in water section.

Garfield.—Painted walls, ceilings, and varnished woodwork in dining rooms of Garfield 1 and Garfield 2 and Beech ward.

Howard Hall.—Painted walls. ceilings. and varnished woodwork in one room in Howard Hall.

Laundry.—Painted stairway in laundry, also stairway leading from Elm to Spruce, and stairway in Relief ward.

Meat Room.—Painted woodwork and walls.

Stable.—Painted woodwork in sleeping quarters.

In addition to the foregoing, various rooms, porches, and portions of buildings have been painted, windows and doors screened, roofing tin painted, radiators bronzed, and other painting and glazing done that was necessary to the institution.

New floors.—New floors have been laid in Toner Building, Dawes Building, some of the buildings of the Richardson group, Hitchcock Hall, and others repaired where it was found necessary throughout the institution.

Screens.—New screens have been placed in various buildings where it was found desirable and the screen doors and windows kept in repair.

Library.—Several hundred new books have been purchased for the patients' library, and the circulation continues to increase. At the present time there are approximately 1,000 books in continuous circulation among the patient population.

Entertainments.—Moving pictures form the main means of entertainment for the patients during the winter season. A new machine has been ordered to take the place of the one in use. In addition to the moving pictures there is a dance in the amusement hall every Tuesday night during the winter season. There is a concert by the band in some portion of the grounds on Tuesdays and Fridays during the summer season.

Broom-making machinery.—New broom-making machinery has been purchased and installed in the basement of Howard Hall department, where a workroom was established in November. Since this machine has been installed and this workroom established all the brooms and whisk brooms used on the place have been made. We have set aside a portion of the farm land to plant broom corn, and hope that in a short period we will be able to raise all the corn needed for the manufacture of brooms and whisk brooms.

Roofs.—We are continuing our practice of replacing old roofs by putting on new roofs in various portions of the old Center Building. We have purchased the necessary tin to continue this practice and expect in another year the whole of the old building will have been overhauled and new roofs put in place.

Railway.—The locomotive continues in good condition, handling about 800 cars during the year. We have replaced about 800 ties

along the railroad, and the track has been resurfaced a good portion of the way. A change in the roadbed is contemplated during the present year, it being decided to move the tracks to a safer location on account of the slides, and at the same time to eliminate the compound curve of the tracks.

Wooden aqueducts.—The old wooden aqueducts back of the power house and south of the old boiler house, which formerly carried all steam and hot-water pipes and electric wires connecting the power house with the various buildings, and which have been looked upon as a menace to the institution for many years, highly inflammable and in a dangerous condition, have been abandoned and torn down. The pipes and wires in these aqueducts have been transferred to concrete tunnels in connection with the remodeling of the power, heating, and lighting plant.

Furniture and rugs.—New furniture and rugs have been purchased for various places about the institution and linoleum for the floor of the hall in Poplar ward.

Memorial Day services.—The services on Memorial Day were generally observed, there being a large number of visitors present to assist the patients and employees in celebrating the day. On the Sunday preceding the 30th of May services were held in Hitchcock Hall on account of the threatening condition of the weather. As it rained during the morning it was thought to be inadvisable to hold the services outside. On the morning of this day the graves in the cemetery were decorated, this being done by representatives of the Spanish-American War veterans and their assistants, together with the assistance of employees of the hospital.

Cost system.—In carrying out the suggestion of one of the members of the Board of Visitors in reference to installing a relative cost system, conference has been held with a representative of the Efficiency Division of the Civil Service Commission, who officially reported that he had drawn up a plan, which has been adopted by the Secretary of the Interior and put in process of installation. Blanks have been drawn up and submitted to the Comptroller of the Treasury, through the Interior Department, for his approval previous to printing. A contract has been entered into with a meter company for furnishing and installing measuring devices in connection with the power, heating, and lighting system. As soon as the forms have been printed and furnished we will notify the Efficiency Division of the Civil Service Commission, and they will send some of their representatives to the hospital for the purpose of assisting in installing the system. With this assistance we will be enabled to put into effect, it is hoped, at an early period a complete cost system, carrying out the general scheme that we began some years ago of gradually creating a cost system affecting the various branches of the hospital. We believe that when this cost system has been put in working order we will have a first-class accounting system in every way.

Fiduciary relations with the District of Columbia.—We are pleased to report that the District of Columbia have been very prompt in paying their board bill during the past year, and this has expedited the settlement of the claims against the hospital and prevented the inconvenience which existed to such a great extent during previous years. All vouchers received in this office have been promptly settled, and all supplies ordered were furnished in good time.

All accounts of the disbursing officer transmitted to the auditor must now pass through the chief clerk's office and receive his administrative approval before being transmitted through the Interior Department to the auditor. The accounts for the various quarters have been transmitted in proper time, and reports received from the auditor through the account for the period ending March 31, this year. There are no items through that period to which the auditor has taken exception or has suspended which have not been properly explained and afterwards passed.

Accountant of House Committee on District of Columbia.—The House Committee on the District of Columbia, which has been investigating the account between the Government Hospital for the Insane and the District of Columbia, and accounts for the support, clothing, and medical treatment of patients admitted from the District of Columbia to the Government Hospital for the Insane, have completed their work and made report. In this report they state that there is a balance due the United States from the District of Columbia for the fiscal years 1879 to 1912, inclusive, on account of unpaid board of $282,754.26; for interest on unpaid balances, $203,470.01; total due the United States, $486,524.27. (See H. Doc. No. 1628, 63d Cong., 3d sess.)

Reclaimed land.—Much of the land that has been reclaimed by the War Department adjacent to the hospital property appears to have been drained to such an extent that it could be used for farming. A portion of this land has been leased by the War Department to certain parties who are now in possession. It would seem that the interests of the Government would be best conserved by the transfer of this land from the War Department to the Interior Department and the hospital be given permission to cultivate and utilize this land for their interests. A recommendation is included in our estimates asking Congress to make this change.

Leonard Rook safety valve.—Safety valves have been installed in connection with the shower bath in the west lodge ward and the continuous baths in C building. These have been tried for several months and are apparently giving satisfaction. They are arranged in such a manner that the hot water can not be turned on until the cold water is turned on. They are set to a certain temperature, and as soon as the water reaches that temperature the cold water is supposed to enter the pipes and prevent the water from becoming heated to a greater extent. This minimizes the danger of scalding. As soon as a satisfactory test has been given this or similar valve, additional ones will be purchased and installed in all places where there is this possibility of an accident.

Water-closet.—A new class water-closet has been purchased, one which is flushed by means of a valve without a tank. By this means the number of parts is minimized and the possibility of wear and tear lessened and the cost of upkeep reduced. This has been in use a few months and so far has apparently served its purpose. If it proves entirely satisfactory after sufficient time has elapsed in which a fair test can be made, we will probably purchase additional closets of this class and install them where needed.

Change name of hospital.—It is recommended that additional legislation be secured looking toward the change of the name of this insti-

tution from the Government Hospital for the Insane to that of the Government Hospital. This recommendation is in line with changes which have been made in various States—changing the names of their institutions from asylums to hospitals and from insane asylums to State hospitals. While this in itself appears to be a small thing, yet when we consider the fact that all the official stationery which goes out to the families of patients is required to have printed upon it the statutory name of the institution, it can be realized what this means. This correspondence reaches small places where everybody knows the business of everyone else, the absence of a particular relative is noted, and it is soon advertised that this relative is confined in an institution of this sort, which at present seems to place a stigma not only upon the party sick but upon the whole family, and as a result the family dreads to receive any information or correspondence from the institution. Requests are not infrequently made that correspondence be not conducted upon official stationery.

Voluntary commitment.—Further effort should be made toward securing the necessary legislation for voluntary commitment in this institution. With the advancements in the realm of sciences of the mental and the tendency of the people to take advantage of them, there is nothing that could be of more benefit to the people at large than the opening of the doors of this or similar institutions to those who may be in need of the treatment given therein without compelling them to pass through a court and stand trial like a common criminal before they may have these benefits. In connection with this I believe the same bill should change the method of commitment by abolishing the present trial by jury.

WARD SERVICE.

The training school for nurses graduated 17 female and 15 male nurses on June 16. Thirty women and twenty-eight men were promoted from the junior class to the senior class of the training school.

Staff conferences.—During the year 841 cases were presented to conference for consideration. Five hundred and fourteen of these, as shown below, were presented for the first time, 327 having been previously presented.

Cases before staff conferences.

	Male.	Female.	Total.
Discharge	83	44	127
Visit	25	52	77
Parole	50	.....	50
Diagnosis	139	49	188
Special opinion	67	5	72
Second presentation	162	44	206
Third presentation	54	15	69
Fourth presentation	23	2	25
Fifth presentation	11	2	13
Sixth presentation	7	1	8
Seventh presentation	2	1	3
Eighth presentation	2	.....	2
Ninth presentation	1	.....	1
Total	626	215	841

Work of field officer.

Visits made:	
Male—	
White	2
Colored	4
Female—	
White	11
Colored	23
Total	40

Contagious diseases.—During the past year there were six cases of contagious diseases in the institution, which included two cases of typhoid, one of measles, one of diphtheria, one of scarlet fever, and one case of scarlatina form rash.

Vaccination.—The policy put in practice of vaccinating all employees has continued, and several hundred of those who reside on the reservation were vaccinated in the past year. Many of the employees and patients received serum treatment as preventative for typhoid fever.

Physical diseases reported during the year ended June 30, 1915.

	Male.				Female.				
	White.		Colored.		White.		Colored.		
	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Total.
General diseases.									
Alcoholism	4								4
Anemia	1		1			1			3
Carcinoma:									
Liver	1								1
Bladder	1								1
Leg	1								1
Breast					1				1
Diabetes mellitus			1						1
Epithelioma, foot	1								1
Erysipelas	12	1	2		3				18
Gangrene, pulmonary	1								1
Gonorrhea	4		1						5
Heart exhaustion	2								2
Influenza	28	45	4		5	10	6	2	100
Malaria	107	23	24		59	21	14	1	249
Malnutrition					1				1
Measles		1							1
Morphinism	2								2
Myalgia	1				9	6	2	1	19
Parotitis	1								1
Pellagra							1		1
Purpura	1								1
Rheumatism, chronic	4	1	5		9	8	2		29
Rheumatic fever, acute	11	2	4		3	5	4		29
Syphilis	7	1	2		12		32		54
Tuberculosis:									
Glandular			1				1		2
Pulmonary	16	1	6		5	1	8		37
Bone	1		1						2
Typhoid		1							1
Diseases of the nervous system and organs of special sense.									
Angioneurotic edema			1				2		3
Apoplexy	6		3		5		4		18
Blepharitis	1	1							2
Cerumen, impacted	1				1		1		3

Physical diseases reported during the year ended June 30, 1915—Continued.

	Male.				Female.				
	White.		Colored.		White.		Colored.		
	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Total.
***Diseases of the nervous system and organs of special sense*—Continued.**									
Conjunctivitis:									
Acute	27	13	11	.....	5	.....	7	.....	63
Chronic	.....	.....	2	.....	1	.....	.....	.....	3
Dacryocystis	1	.....	.....	.....	.....	.....	.....	.....	1
Epilepsy	3	1	.....	.....	.....	.....	.....	.....	4
Epilepticus status	.....	.....	.....	.....	1	.....	4	.....	5
Granular lids	.....	1	.....	.....	.....	.....	.....	.....	1
Hemorrhage:									
Scleral	1	.....	3	.....	1	.....	.....	.....	5
Subconjunctival	.....	.....	1	.....	2	2	3	.....	8
Hiccough	1	.....	.....	.....	.....	.....	.....	.....	1
Hordeolum	4	1	3	.....	2	.....	.....	.....	10
Hyperidrosis	.....	.....	.....	.....	.....	1	.....	.....	1
Hypopion	2	.....	.....	.....	.....	.....	.....	.....	2
Hysteria	.....	.....	.....	.....	.....	2	.....	.....	2
Iritis	2	.....	.....	.....	.....	.....	.....	.....	2
Keratitis, interstitial	.....	.....	.....	.....	.....	.....	1	.....	1
Migraine	1	.....	.....	.....	12	3	2	.....	18
Neuralgia:									
Facial	2	.....	.....	.....	3	3	1	.....	9
Interstitial	.....	.....	.....	.....	2	.....	.....	.....	2
Neuralgia	.....	.....	.....	.....	.....	.....	1	.....	1
Neurasthenia	.....	.....	.....	.....	.....	.....	1	.....	1
Neuritis	1	.....	3	.....	.....	.....	.....	.....	4
Optic atrophy	.....	.....	3	.....	.....	.....	.....	.....	3
Otitis media	4	2	6	.....	15	1	1	.....	29
Paraplegia, old	.....	.....	.....	.....	.....	.....	1	.....	1
Paresis	.....	.....	.....	.....	1	.....	6	.....	7
Sciatica	.....	.....	.....	.....	.....	.....	1	.....	1
Tinnitis	1	.....	.....	.....	.....	.....	.....	.....	1
Diseases of the circulatory system.									
Aortic insufficiency	.....	.....	.....	.....	1	.....	.....	.....	1
Arteriosclerosis	6	.....	.....	.....	1	.....	.....	.....	7
Cardiac dilatation	1	.....	3	.....	1	.....	.....	.....	5
Cardiac valvular disease	1	.....	2	.....	1	.....	.....	.....	4
Endocarditis:									
Acute	1	.....	.....	.....	.....	.....	2	.....	3
Chronic	8	.....	1	.....	.....	1	.....	.....	10
Epistaxis	.....	.....	3	.....	.....	.....	.....	.....	3
Hemorrhoids	11	.....	5	.....	6	.....	1	.....	23
Myocarditis, chronic	3	.....	14	.....	1	.....	.....	.....	18
Pericarditis	.....	3	.....	.....	1	.....	.....	.....	4
Phlebitis	1	1	.....	.....	.....	.....	1	.....	3
Varicose ulcer	3	.....	2	.....	.....	.....	1	.....	6
Varicose veins	.....	.....	.....	.....	1	.....	.....	.....	1
Diseases of the respiratory system.									
Asthma	1	.....	.....	.....	2	.....	.....	.....	3
Bronchitis:									
Acute	16	62	23	8	34	17	28	.....	188
Chronic	9	1	3	.....	.....	.....	.....	.....	13
Broncho-pneumonia	5	2	4	.....	3	1	2	.....	17
Empyema	2	.....	.....	.....	.....	.....	.....	.....	2
Hay fever	1	.....	.....	.....	.....	.....	.....	.....	1
Laryngitis	13	13	1	.....	.....	3	.....	.....	30
Pleurisy	5	2	3	1	2	3	.....	1	17
Pulmonary hypostatic congestion	3	.....	.....	.....	.....	.....	.....	.....	3
Rhinitis	39	33	9	1	41	1	25	.....	149
nusitis	.....	.....	.....	.....	1	.....	.....	.....	1
Diseases of the digestive system.									
Adenitis, sublingual	.....	.....	1	.....	.....	.....	.....	.....	1
Alveolar abscess	6	1	.....	.....	.....	.....	.....	.....	7
Amœbic dysentery	1	.....	.....	.....	.....	.....	.....	.....	1
Appendicitis	2	1	.....	.....	.....	.....	.....	.....	3

Physical diseases reported during the year ended June 30, 1915—Continued.

	Male.				Female.				
	White.		Colored.		White.		Colored.		
	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Total.
***Diseases of the digestive system*—Con.**									
Atonic ileus	1								1
Cholecystitis					5		1		6
Cholelithiasis		1							1
Colitis	1								1
Constipation	26								26
Diarrhea	3								3
Enteritis	31	5	6		65	4	13	1	125
Enterocolitis	29	3	1						33
Fecal impaction	1								1
Gastric atony					2				2
Gastric ulcer		1							1
Gastritis	9	9	6		21	4		1	50
Gastroenteritis	9	1	3						13
Gingivitis	1	1	13						15
Glossitis	1								1
Hepatic cirrhosis	1								1
Hernia:									
Incarcerated	3								3
Inguinal	1					1			2
Post-operative	1					1			2
Scrotal	1								1
Hyperchlorhydria	5	5	2			1			13
Parotitis	1								1
Peritonsillar abscess	1	1	1						3
Pharyngitis	11	6	14		30		6		67
Ptyalism	1		1				1		3
Pyorrhea alveolaris	11		19		1		11		42
Rectal abscess		1							1
Stomatitis	10		4		8		1		23
Tonsillitis	25	29	3		28	22	36	1	144
Nonvenereal diseases of the genito-urinary system and adnexa.									
Abortion:									
Self-induced						3			3
Threatened						1			1
Albuminuria					12		6		18
Amenorrhea					2				2
Balanitis	1								1
Balanoposthitis	1								1
Calculus, urethra	1								1
Condylomata acuminata			1						1
Cystitis	8	1	8						17
Dysmenorrhea					7	13	3		23
Monorrhagia					1				1
Nephritis:									
Acute		6			6		3		15
Chronic	19	3	11		24		8		65
Orchitis	11								1
Paraphimosis	1								1
Prostatic hypertrophy	2								2
Uterine tumor					1				1
Diseases of the skin and cellular system.									
Abscess	61	11	32	2	7	4	3	1	121
Acne vulgaris	2				2				4
Adenitis			1		1	1			3
Carbuncle	6								6
Cellulitis	9		3		1		1		14
Chancroid	1								1
Dermatitis	2				6	1	2		11
Dermatitis venanata	3	1			1	3			8
Eczema	6		11		10		2		29
Erythema						1			1
Furunculosis	58	12	6		5	2			83
Gangrene		1							1
Herpes	2				1				3
Herpes labialis					1		1		2

Physical diseases reported during the year ended June 30, 1915—Continued.

	Male.				Female.				
	White.		Colored.		White.		Colored.		
	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Total.
***Diseases of the skin and cellular system*—Continued.**									
Herpes zoster	2	1	2	.....	2	.....	.....	.....	7
Impetigo	3	.....	.....	.....	.....	.....	.....	.....	3
Intertrigo	.....	.....	.....	.....	1	.....	1	.....	2
Lichens planus	.....	.....	1	.....	.....	.....	.....	.....	1
Paronychia	1	.....	1	.....	.....	.....	.....	.....	2
Pediculosis	2	.....	1	.....	.....	.....	1	.....	4
Pityriasis	2	.....	.....	.....	.....	.....	.....	.....	2
Psoriasis	1	.....	.....	.....	1	.....	.....	.....	2
Raynaud's disease	1	.....	.....	.....	.....	.....	.....	.....	1
Trichophytosis	5	2	.....	.....	.....	.....	.....	.....	7
Ulcer	6	3	6	.....	.....	.....	.....	.....	15
Urticaria	1	.....	1	.....	1	.....	1	.....	4
Veratosis	1	.....	.....	.....	.....	.....	.....	.....	1
Verruca	1	.....	1	.....	.....	.....	.....	.....	2
Affections due to external causes.									
Burns	12	7	6	6	15	4	11	.....	61
Bursitis	1	.....	.....	.....	.....	.....	2	.....	3
Decubitus	4	1	.....	.....	11	.....	5	.....	21
Dislocation	2	.....	.....	.....	.....	.....	.....	.....	2
Dislocation:									
Ankle	.....	.....	.....	.....	1	.....	.....	.....	1
Elbow	.....	.....	.....	.....	.....	.....	1	.....	1
Finger	.....	.....	.....	.....	1	.....	.....	.....	1
Hip	1	.....	.....	.....	.....	.....	.....	.....	1
Shoulder	2	.....	.....	.....	1	.....	.....	.....	3
Fracture:									
Astragalus	1	.....	.....	.....	.....	.....	.....	.....	1
Femur	5	.....	.....	.....	3	.....	.....	.....	8
Fibula	.....	.....	.....	.....	1	.....	.....	.....	1
Humerus	3	.....	.....	.....	.....	.....	.....	.....	3
Malar	1	.....	.....	.....	.....	.....	.....	.....	1
Mandible	.....	.....	.....	.....	1	.....	.....	.....	1
Metacarpal	4	1	1	.....	1	.....	.....	.....	7
Nose	1	.....	.....	.....	.....	.....	.....	.....	1
Patella	2	.....	.....	.....	.....	.....	.....	.....	2
Radius	2	1	.....	.....	.....	.....	.....	.....	3
Rib	3	1	.....	.....	.....	.....	.....	.....	4
Spinal column	1	.....	.....	.....	.....	.....	.....	.....	1
Tibia	1	.....	.....	.....	1	.....	1	.....	3
Tibia and fibula	.....	.....	.....	.....	.....	.....	1	.....	1
Ulna	.....	1	.....	.....	.....	.....	.....	.....	1
Ulna and radius	.....	.....	.....	.....	.....	1	1	.....	2
Rupture of intestines	1	.....	.....	.....	.....	.....	.....	.....	1
Sprains	8	8	5	1	5	2	3	.....	22
Strangulation	.....	.....	.....	.....	1	.....	1	.....	2
Wounds:									
Contused	159	19	21	5	119	.....	36	.....	359
Infected	26	4	11	.....	50	5	8	.....	104
Lacerated	269	23	64	12	13	1	13	.....	395
Incised	6	.....	7	.....	8	.....	2	.....	23
Diseases of the bones and organs of locomotion.									
Arthritis deformans	1	.....	.....	.....	.....	.....	.....	.....	1
Infectious polyarthritis	1	.....	.....	.....	.....	.....	.....	.....	1
Periostitis	.....	.....	.....	.....	1	.....	.....	.....	1
Pes equinus	1	.....	.....	.....	.....	.....	.....	.....	1
Total	1,315	384	436	36	741	165	351	9	3,436

Deaths during the year ended June 30, 1915.

	Male.				Female.				
	White.		Colored.		White.		Colored.		
	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Patient.	Employee.	Total.
Aneurism, rupture	1								1
Atonic ileus	1								1
Bronchitis, acute			1						1
Bulbar paralysis	1								1
Carcinoma:									
Bladder	1								1
Liver	1								1
Cardiac incompensation					1		2		3
Cardiovalvular disease	15		1		2		2		20
Cerebral arteriosclerosis	1		1				1		3
Cerebral hemorrhage	8				2		1		11
Cerebral softening	1								1
Cerebral syphilis	8		6		1		2		17
Cerebrospinal meningitis							1		1
Cholecystitis	1								1
Chorea, Huntington's	2								2
Cystitis			1						1
Diabetes mellitus	1								1
Encephalitis, suppurative							1		1
Endocarditis	7		2		5		3		17
Enteritis	3								3
Enteritis, ulcerative	1								1
Enterocolitis	5				2		2		9
Epithelioma, nose	1								1
Erysipelas	2								2
Gastritis	1								1
Gastroenteritis, acute			1						1
Intestinal constriction							1		1
Intracranial tumor							1		1
Myocarditis	23		2		3				28
Nephritis	22		4		1				27
Organic brain disease	9		2		3		3		17
Pachymeningitis, cerebral	1								1
Paresis	31		13		2		4		50
Pellagra							1		1
Pericarditis, acute	1	1							2
Peritonitis	1								1
Pneumonia:									
Broncho	20		7		4		1		32
Lobar	4								4
Progressive muscular atrophy	1								1
Pulmonary hemorrhage:									
Traumatic			1		1				2
Hypostatic congestion	6								6
Rupture of aorta	1								1
Scalding			1						1
Senile exhaustion					2				2
Status epilepticus	5		6		1		4		16
Subdural hemorrhage					1				1
Suicide	1								1
Suicide, strangulation					1				1
Tuberculosis:									
Intestinal			1						1
Miliary			2				1		3
Pulmonary	22		5		2		4		33
Total	210	1	57		34		35		337

Operations.—There were 531 minor operations performed by members of the staff during the year. The following are the major and other operations performed by the consulting staff:

Major operations performed by the consulting staff.

Amputation of gangrenous toes	1
Appendectomy	3
Cast for fracture of right arm	1
Cast for fracture of right leg	1
Cast for fracture of tibia and fibula	1
Cataract, extraction	1
Cystotomy, suprapubic	2
Empyema	1
Excision of parotid	1
Denotomy for contractures of feet	1
Hermiotomy	1
Hydrocele	2
Incision and drainage of infected hand	1
Laparotomy	2
Operation for setting tibia and fibula	1
Operation for fractured patella	2
Total	22

The operations were performed by the following consulting surgeons:

Dr. Vaughan	6
Dr. Taylor	7
Dr. White	8
Dr. Kimball	1
Total	22

Work of the hydrotherapeutic department.

	Male, white.	Female.		Total.
		White.	Colored.	
Average number of patients treated per month	109.3	58.9	48.3	216.5
Average number of treatments per month	1,996.7	1,616.0	1,379.9	4,992.6
Total number of treatments	23,961	19,401	16,559	59,921

Dr. A. D. Weakley, in charge of the dental department, submits the following report of work done during the year:

Work of dental department during year ended June 30, 1915.

Number of cases treated	2,069
Average number of patients treated per month	172.42
Examinations and treatments:	
Extractions	1,872
Treatments	924
Fillings	893
New artificial dentures (made)	47
Old artificial dentures (repaired)	41
Mouths cleaned	231
Crowns made	1
Total	4,009

Dr. Arthur H. Kimball, in charge of the eye, ear, nose, and throat department, submits the following report of the work done during the year:

Work of the eye, ear, nose, and throat department during the year ended June 30, 1915.

Number of visits	54
Number of patients	625
Errors of refraction	249
Other diseases of the eye	176
Diseases of the ear	53
Diseases of the nose and throat	48
Major operations	2

REPORT OF THE CLINICAL PSYCHIATRIST.

From February 1 to June 30, 1915, inclusive. No reports for December, 1914, and January, 1915, were submitted because the work of the department was organized during that period.

Cases studied with junior physicians:

Alcoholic hallucinosis	4
Anxiety depression	4
Cerebral lues	8
Confusion associated with cerebral lesions	8
Dementia precox types	68
Intoxication psychoses	3
Manic depressives	17
Mental defectives	4
Paranoid states	9
Paresis	22
Psychoneurosis	1
Psychosis associated with epilepsy	6
Senile dementia	15
Syringomyelia	1
Undifferentiated depression	9
Undifferentiated psychosis	1
Total	180

Cases studied with senior physicians:

Alcoholic hallucinosis	1
Anxiety depression	2
Anxiety hallucinatory state	2
Dementia precox types	2
Kleptomania	1
Total	8

Cases given special analysis—since many of these cases covered periods longer than one month, each case given consistent psychotherapeutic treatment is tabulated each month:

Anxiety depression	8
Dementia precox types	44
Manic-depressive types	4
Paranoid types	10
Psychosis associated with epilepsy	3
Hysteria	1
Total	70

SCIENTIFIC DEPARTMENT.

Course for internes.—The regular course for internes was given from October 26 to December 20, 1914. Thirty-two exercises were given in all, and the course was satisfactorily completed by the seven internes who attended. This year we are indebted to Mr. Frederick A. Fenning, a member of the District bar, for a comprehensive summing up of certain medico-legal matters which were of especial interest to physicians in hospitals of this character.

A definite rule was made regarding the examinations, which will apply in the future, namely, that a general average grade of 75 per

cent must be obtained, and in no case will the results of the examination be considered to be satisfactory unless a grade of 60 per cent be reached in every part of the course. This rule will tend to prevent a too early specialization of intellectual effort on the part of the internes toward certain parts of the course, and thus aid our efforts to provide a general groundwork.

Psychological laboratory.—The work in the psychological laboratory has been, for the most part, work of investigation. In addition to the work of the psychologist, the clinical psychiatrist and Mrs. Kempf have been making some intensive studies on the behavioristic characteristics as illustrating certain aspects of the mental life of monkeys for the purpose of outlining a genetic approach to certain problems of instinctive behavior.

Pathological laboratory.—The number of autopsies performed during the year was 159. The number of histopathological examinations was 69. The fact that the histological examinations were not as many as the autopsies is due to the enforced absence of the histopathologist for a considerable period of time during the year on account of illness.

A technician was appointed June 1, 1915.

The following table gives the usual data regarding the incidence of tuberculosis:

Pulmonary tuberculosis in those who died during the years ended June 30, 1885–1915.

Date.	Deaths.	Post-mortem examinations.	Cases not examined, post-mortem.	Deaths due to pulmonary tuberculosis.	Well-marked pulmonary tubercular cases, post-mortem.	Cases of latent or limited pulmonary tuberculosis found in autopsies.	Total of pulmonary tubercular cases examined, post-mortem.	Cases of pulmonary tuberculosis among those not examined by autopsy, based upon clinical diagnosis.	Total of all cases of death with pulmonary tuberculosis, clinical and post-mortem.	Percentage of pulmonary tubercular cases among those that died, recognized clinically and at autopsy.	Percentage of those examined, post-mortem, which showed pulmonary tubercular lesions.	Cases which died of other diseases than pulmonary tuberculosis.
1885.....	105	69	36	13	18	3	21	2	23	21.9	30.4	82
1886.....	102	72	30	24	26	1	27	8	35	34.3	37.5	75
1887.....	92	49	43	13	9	1	10	9	19	20.6	20.4	73
1888.....	120	79	41	14	14	6	20	8	28	23.3	25.3	106
1889.....	114	67	47	23	19	3	22	10	32	28.0	32.8	91
1890.....	140	108	32	20	22	10	32	6	38	27.1	29.6	126
1891.....	128	79	49	21	13	5	18	13	31	24.2	22.7	107
1892.....	153	96	57	13	13	9	22	9	31	20.2	23.0	149
1893.....	181	117	64	22	34	9	43	8	51	28.1	36.7	139
1894.....	167	115	52	28	27	13	40	13	53	31.7	34.7	139
1895.....	179	125	54	18	20	6	26	11	37	20.6	20.8	161
1896.....	187	119	68	21	23	11	34	12	46	24.6	28.5	168
1897.....	162	90	72	13	15	4	19	9	28	17.2	21.1	149
1898.....	197	85	112	19	17	3	20	14	34	17.6	23.5	178
1899.....	193	81	112	31	22	3	25	20	45	23.3	30.8	162
1900.....	184	94	90	25	17	6	23	10	33	17.9	24.4	159
1901.....	226	109	117	31	27	14	41	16	57	25.0	37.8	196
1902.....	177	92	85	19	20	7	27	7	34	29.3	29.0	156
1903.....	258	125	133	36	25	18	43	15	58	22.5	34.4	222
1904.....	243	103	140	28	15	5	20	13	33	13.6	19.4	215
1905.....	236	114	122	28	18	6	24	12	36	15.2	21.0	208
1906.....	202	114	88	29	18	11	29	11	40	19.8	25.4	173
1907.....	216	128	88	33	16	15	31	17	48	22.2	24.2	184
1908.....	201	128	73	14	12	15	27	4	31	15.4	21.0	157
1909.....	255	164	91	38	30	29	59	9	68	26.6	35.9	217
1910.....	260	161	99	25	21	28	49	16	65	25.0	30.5	226
1911.....	280	165	115	41	28	29	57	8	65	23.2	31.7	239
1912.....	332	183	149	44	21	59	80	27	107	32.2	43.9	288
1913.....	321	173	148	40	35	48	83	17	100	31.2	47.9	251
1914.....	322	123	199	30	14	26	40	16	56	17.7	32.5	282
1915.....	337	159	178	33	22	20	42	17	59	22.7	26.4	304
Total..	6,270	3,485	2,785	787	631	424	1,054	367	1,421	22.7	30.2	5,433

Clinico-pathological laboratory.—The accompanying table gives an outline of the work carried on in the clinico-pathological laboratory:

Blood, cytology	30
Cerebrospinal fluid, general examinations	100
Feces	3
Pus	16
Sputum	183
Urine	1,187
Wassermann reactions	1,142
Stomach contents	2
Total	2,663

Photographic department.—There have been made by the photographer 700 photographs of patients, 59 pictures, and 35 lantern slides for the administration department, and 6 pictures for the scientific department.

Miscellaneous.—Room and facilities for the conduct of investigations of entamoeba bacalis have been furnished to Dr. C. W. Stiles, of the Hygienic Laboratory of the Public Health Service, in the pathological laboratory. This work is being conducted with the cooperation of the dental department.

Dr. J. D. Stout, of the George Washington Medical School, has been given the opportunity of carrying on investigations with neurological cases, and has been of considerable assistance in the examination of some neurological cases which are of interest.

On May 24, 1915, there was inaugurated the system of sending junior or assistant physicians to the laboratories for a three months' period of training. This innovation is expected to give to the hospital better trained men to carry on certain kinds of work and at the same time to give to the ward physicians a much more adequate conception of scientific methods and prepare them for the conduct of investigation along lines that can only be carried out by a close cooperation of ward observations with laboratory methods. At present the general scheme is not only to rotate the younger medical officers in the different laboratories, but also on the different services. With our present organization this will give them a certain amount of laboratory work which is of great value in order that they may have a better appreciation of the meaning of laboratory findings, and also by appreciating the laboratory problems enable them to cooperate more intelligently with the laboratory when they get back to their ward service. In addition to this they will have service on the acute receiving services where they will come under the immediate supervision and direction of the clinical psychiatrist, who is especially equipped to deal with various problems of a psychological and so-called functional character. Then in the regular rotation they will receive special instruction in the psychological laboratory, where the psychologist has been requested to devote his time exclusively to a consideration of organic conditions, such as depend upon gross changes in the brain, the spinal cord, and the peripheral mechanisms. Here they will receive instruction as to methods of examination, diagnosis, and treatment, which will be of special value in handling organic conditions, such as hemiplegias, aphasias, and the like. With this scheme of rotation it is believed that the younger physician will get a very well rounded survey of all of the problems with which he must deal in an institution of this sort.

PUBLICATIONS.

The following publications by members of the hospital staff have appeared during the year:

White, William A., superintendent:

Moon myth in medicine. The Psychoanalytic Review, vol. 1, No. 3, July, 1914, pp. 241–256. (Read at a joint meeting of the Medical History Club of Washington, D. C., and the Medical Society of the District of Columbia, pp. 348–352.)

Charles Goring's "The English Convict," a symposium. Journal of the American Institute of Criminal Law and Criminology, Vol. V, No. 3, September, 1914, pp. 348–352.

The new ideal. The Maryland Psychiatric Quarterly, Vol. IV, No. 2, June 25, 1914, pp. 37–48. (Address delivered at the laying of the cornerstone of the John Hubner Psychiatric Building at Springfield State Hospital, June 25, 1914.)

The significance of medical gatherings. Virginia Medical Semimonthly, vol. 19, No. 16, November 27, 1914, pp. 394–399. (Address delivered before the Medical Society of Virginia at its forty-fifth annual meeting at Washington, D. C., Oct. 27 to 30, 1914.)

The unconscious. The Psychoanalytic Review, Vol. II, No. 2, April, 1915, pp. 177–190.

Psychoanalytic parallels. The Psychoanalytic Review, Vol. II, No. 2, April, 1915, pp. 177190. (Read at a meeting of the Associated Physicians of Montclair and vicinity Montclair, N. J., Nov. 23, 1914.)

Franz, Shepherd Ivory, scientific director:

Delusions. Popular Science Monthly, vol. 86, No. 1, January, 1915, pp. 80–91.

Symptomatological differences associated with similar cerebral lesions in the insane. Psychological Monograph No. 81, April, 1915, pp. 1–79.

Variations in distribution of the motor centers. Psychological Monograph No. 81, April, 1915, pp. 80–162.

Kempf, Edward J., clinical psychiatrist:

The integrative functions of the nervous system applied to some reactions in human behavior, and their attending psychic functions. The Psychoanalytic Review, Vol. II, No. 2, April, 1915. (Read before the American Medico-Psychological Association, seventieth annual meeting, Baltimore, Md., May 26–29, 1914.)

The behavior chart in mental diseases. American Journal of Insanity, Vol. LXXI, No. 4, April, 1915.

O'Malley, Mary, senior assistant physician:

Psychoses in the colored race: A study in comparative psychiatry. American Journal of Insanity, Vol. LXXI, No. 2, October, 1914, pp. 309–337.

Gleuck, Bernard, senior assistant physician:

The forensic phase of litigious paranoia. Journal of the Amer. Inst. of Crim. Law and Criminology, Vol. V, No. 3.

Translation of Olaf Kinberg: Alcohol and criminality. Ibid., Vol. V, No. 4.

Review: Sexuelle Anomalien, Ihre Psychologische Wertung und deren Forensische Konsequenzen, by Ludwig Frank. Ibid., Vol. VI, No. 2.

Lind, John E., senior assistant physician:

The dream as a simple wish-fulfillment in the negro. The Psychoanalytic Review, July, 1914, Vol. I, No. 3, pp. 295–300.

Partial analysis of an ether anestheisa dream. Alienist and neurologist, Vol. XXXV, No. 3, August, 1914, pp. 310–317.

The color complex in the negro. The Psychoanalytic Review, October, 1914, Vol. I, No. IV, pp. 404–414.

The treatment of bedsores. New York Med. Journal. Jan. 2, 1915, Vol. CI, No. 1, pp. 25–26.

The early diagnosis of general paresis. International Clinics, March, 1915, Vol. I, ser. 25, pp. 115–133.

Combined psychoses. The Journal of Nervous and Mental Disease, April, 1915, vol. 42, No. 4, pp. 217–234.

Murphy, John P. H., assistant physician:

Mannerisms and their relations to the physic life. New York Medical Journal, Feb. 20, 1915, p. 347.

Typhoid and the psychoses. Publication International Clinics, Vol. II, XXV Series, June, 1915, p. 172.

Hough, William H., assistant physician:
(With Dr. E. B. Vedder, captain, Medical Corps, U. S. A.) Prevalence of syphilis among the inmates of the Government Hospital for the Insane. Jour. of Amer. Med. Assoc., Mar. 30, 1915, Vol. LXIV, pp. 972–975.
Pfeiffer, John A., assistant physician:
Case of chronic progressive chorea with anatomical study. Amer. Jour. of Insanity, Vol. LXXI, No. 3, January, 1915.
Neuropathological findings in a case of pernicious anemia with psychical implication. Jour. of Nerv. and Ment. Dis., vol. 42, February, 1915, pp. 75–93.
Evarts, Arrah B., assistant physician:
Dementia præcox in the colored race. The Psychoanalytic Review, Vol. I, No. 4, October, 1914.
Report of a case of aphasia and apraxia. New York Medical Journal, Dec. 19, 1914.
Shockley, Francis M., assistant physician:
The rôle of sexuality in the genesis of paranoid conditions. The Psychoanaytic Review, Vol. I, No. 4, October, 1914, pp. 431–438.
O'Neil, D. G., assistant physician:
Some observations on the symptomatic psychoses of the nephritic group. Alienist and Neurologist, Vol. XXXV, November, 1914, pp. 351–364.
Translation of K. Bonhoeffer: Infection and intoxication psychoses. Alienist and Neurologist, Vol. XXXV, November, pp. 345–350.
Wender, Louis, assistant physician:
The applicability of Binet-Simon intelligence tests in psychoses of the senium. New York Medical Journal, Vol. CI, Mar. 6, 1915, pp. 448–454
Ernest, John R., junior assistant physician:
The importance of the early recognition of the mental limitations of the præcox type. The Medical Record, May 29, 1915, pp. 1–7.
Sheehan, Robert, passed assistant surgeon, U. S. Navy:
Service use of intelligence tests. U. S. Naval Medical Bulletin, vol. 9, No. 2, pp. 1–9.

STAFF CHANGES.

The following resignations took effect during the year: Herman G. Maul, medical interne; William H. Hough, assistant physician; Frank H. Dixon, junior assistant physician; Miss Cornelia Allen, chief of the training school for nurses. Capt. Edgar King, M. D., assigned from the United States Army, was transferred to the Disciplinary Barracks at Fort Leavenworth in July, 1914.

The following new appointments were made during the year: William F. Rice, medical interne; Neal A. Harper, dental interne; Joseph Nack, medical interne; Mildred E. Sheetz, medical interne; Edward J. Kempf, clinical psychiatrist. Capt. Thomas W. Woodson, Medical Corps, was assigned to this hospital from the United States Army in July, 1914, vice Capt. King.

NEEDS OF THE HOSPITAL.

The appropriations recommended for the fiscal year ending June 30, 1917, are as follows:

During the past year there has been admitted to the institution 656 patients, which was 96 less than the previous year. The total number under treatment during the year was 3,718, which was 22 less than during the previous year. The daily average in the hospital for the past year was 3,032, showing an increase in this average of 7. It would seem, in view of the foregoing, that the same amount would be needed for next year as has been allowed for the present year; that is, based on 3,170 patients, each at $220 per capita, together with the $55,000 for general repairs and improvements and $5,000 for roadways, walks, and grading would amount to $757,400.

Pursuing the usual method of calculating, the District of Columbia's share for 1,725 patients should be $412,150, and the balance for 1,445 patients, amounting to $285,250, should be provided for by Congress in the sundry civil bill.

Storehouse.—The hospital should have a separate storehouse and shop building, and, now that Congress has provided an appropriation, we are planning to build a wall around Howard Hall, this compelling the electrical department to move. It is needed more than ever, and the necessity for having a central place for mechanical departments and storeroom can not be too strongly stated. We have at present one main storeroom and many small ones connected with the various departments. In the main storeroom we have installed perpetual inventory cards, keeping track of all the supplies on hand at a given time. It is desirable, therefore, to have this central storeroom and shop building as soon as possible. If this was done, we could vacate Center Lodge and carpenter shop and group of buildings around the present storehouse and laundry. Center Lodge proper could then be remodeled and used for the purpose recommended, viz, the linen room under the matron. This building, if built, should be built in such a manner as to have a store yard attached where lime, sand, and gravel and such articles could be stored under proper supervision.

Gate house.—We have a new entrance, the road has been cut through and completed, and only the new gate house and gates are needed. This hospital has many visitors—relatives and friends of the patients in addition to sight-seers—and some accommodation should be provided not only as a convenience while waiting for cars but also in the way of a public-comfort station while the visitors are at the institution.

Fence.—The need of a new fence around this institution is so apparent that it would only be necessary to be seen to be fully realized. At the present time much of this fence is down and some of it is only waiting for a strong gust of wind to level it. An appropriation is desirable amounting to $14,000 to erect this fence extending the full length of the west side of Nichols Avenue and around the Hamilton Road side of the hospital.

Staff quarters.—Additional quarters should be provided for the hospital staff. At the present time they are quartered on the second floor of the administration building and in various parts of the institution. The office part of the administration building is at present crowded for room and it will not be long before it will be necessary to provide additional room for the various offices. The growth of this institution has been so rapid of late—the increase in the number of patients together with the number of records required—that a great deal more space for administrative purposes is needed. In line with this it will soon be necessary in seeking additional room to go to the second floor of the administration building now being used by the staff officers for their residences. Therefore it is recommended that an appropriation be secured to provide staff quarters to house these officers.

Elevators.—The building inspector of the District in inspecting the elevators stated that two of the elevators, viz, the one in the kitchen building by which the food is lowered into the tunnels to be sent to the various wards and that in the laundry by which the clothes are

raised and lowered from the washing room to the ironing room and repair shops, are of such old-fashioned class and in such poor condition that he was compelled to condemn both of them and that they should no longer be used. In replacing these it would be advisable to install electric elevators, which could be done at a cost of $3,675. From the report is would seem that it is not safe to continue the present elevators in use, and it is therefore quite urgent that this appropriation be granted.

Ice plant.—Our present ice-making and refrigerating plant has been in use many years and is not equal to furnishing the ice and refrigeration needed at the present time. We have in use one machine of 20 tons capacity and two machines of 6 tons capacity each. The 20-ton capacity machine has been in use about 10 years, the others more than 15 years. They are in continual use 24 hours each day and have worn to such an extent that it is necessary to provide for a large amount of repairs, as we are always in danger of a breakdown just when we would need this plant the most. This plant is located in the rear, under the old Center Lodge, in a dark and hot place, where at times during the summer the temperature registers considerably over 100°. It is therefore desirable to remodel the old house formerly used as a boiler plant for the purpose of using it as an ice-manufacturing plant and provide one additional engine of 30 tons capacity and tank to hold 200 ice cans. This could be done at an expenditure of $19,000.

Summary of appropriations recommended.

Support	$697,400
General repairs and improvements	55,000
Roadways, walks, and grading	5,000
Shop and storehouse building	24,755
Gate house	8,000
New fence	14,000
Staff quarters	25,000
Electric elevators	3,675
Ice plant	19,000
Total	851,830

STATISTICAL TABLES.

Admissions and discharges.

	Male.			Female.			Total.
	White.	Colored.	Total.	White.	Colored.	Total.	
Remaining June 30, 1914:							
Army	851	46	897				897
Navy	282	14	296	1		1	297
United States Public Health Service	40	6	46				46
Civil life	702	326	1,028	506	288	794	1,822
Total	1,875	392	2,267	507	288	795	3,062
Admitted during the year 1915:							
Army	136	17	153				153
Navy	79	1	80				80
United States Public Health Service	7		7				7
Civil life	143	88	231	109	76	185	416
Total	365	106	471	109	76	185	656
Discharged during the year 1915:							
Recovered—							
Army	24	3	27				27
Navy	30		30				30
United States Public Health Service	2		2				2
Civil life	25	7	32	16	10	26	58
Total	81	10	91	16	10	26	117
Improved—							
Army	14	1	15				15
Navy	8	1	9				9
United States Public Health Service							
Civil life	17	9	26	16	7	23	49
Total	39	11	50	16	7	23	73
Unimproved—							
Army	13		13				13
Navy	2		2				2
United States Public Health Service	1		1				1
Civil life	42	13	55	15	13	28	83
Total	58	13	71	15	13	28	99
Not insane—							
Army							
Navy	6						6
United States Public Health Service							
Civil life	4	2	6	1	3	4	10
Total	10	2	12	1	3	4	16
Deceased—							
Army	134	7	141				141
Navy	25		25				25
United States Public Health Service	4	1	5				5
Civil life	45	49	94	36	36	72	166
Total	208	57	265	36	36	72	337
Remaining June 30, 1915:							
Army	802	52	854				854
Navy	290	14	304	1		1	305
United State Public Health Service	40	5	45				45
Civil life	712	334	1,046	531	295	826	1,872
Total	1,844	405	2,249	532	295	827	3,076

Admissions and discharges, classified according to sex, for the year ended June 30, 1915, and since the opening of the hospital in 1855.

	Year ended June 30, 1915.			Since opening of the hospital.		
	Male.	Female.	Total.	Male.	Female.	Total.
Admitted	471	185	656	17,079	5,069	22,148
Discharged:						
Recovered	103	30	133	5,545	1,308	6,853
Improved	50	23	73	2,398	911	3,309
Unimproved	71	28	99	879	354	1,233
Died	265	72	337	6,008	1,669	7,677
Remaining	2,249	827	3,076	.....	.....	.....
Total admissions	.....	.....	.....	17,079	5,069	22,148

Percentage of total admissions, recovered, improved, etc.

	Male.	Female.	Total.
Recovered	32.46	25.81	30.94
Improved	14.04	17.97	14.94
Unimproved	5.15	6.98	5.56
Died	35.18	32.92	34.66
Remaining	13.17	16.32	13.90
Total	100.00	100.00	100.00

Monthly changes of population.

Date.	Admitted.			Discharged.			Died.			Total died and discharged.
	Male.	Female.	Total.	Male.	Female.	Total.	Male.	Female.	Total.	
1914.										
July	25	11	36	20	6	26	31	2	33	59
August	32	15	47	16	9	25	17	8	25	50
September	45	15	60	28	5	33	19	4	23	56
October	17	19	36	23	9	32	25	8	33	65
November	56	15	71	15	6	21	14	4	18	39
December	40	18	58	10	8	18	26	4	30	48
1915.										
January	28	10	38	25	14	39	24	4	28	67
February	30	5	35	9	4	13	26	12	38	51
March	31	21	52	12	4	16	24	7	31	47
April	46	11	57	26	1	27	24	8	32	59
May	62	27	89	20	4	24	17	3	20	44
June	59	18	77	20	11	31	18	8	26	57
Total	471	185	656	224	81	305	265	72	337	642

Admissions, discharges, and deaths, with the mean annual mortality and proportion of recoveries, per cent of the discharges, including deaths, for each year since the opening of the hospital.

Year.	Admitted.			Discharged.											Remaining June 30 in each year.			Daily average.			Percentage of recoveries on discharges.			Percentage of deaths on average numbers.			Percentage of deaths on total number.		
				Recovered.			Improved.			Unimproved.			Died.																
	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.
1855	23	37	63	....	3	3	....	....	....	....	....	....	....	....	....	26	34	60	19.35	20.65	40.00	.....	100.00	100.00	.....	.....	.....	.....	.....	.....
1855-56	36	11	47	3	2	5	....	....	....	....	1	1	5	3	8	54	39	93	41.20	37.98	70.18	37.50	33.33	35.71	12.13	7.09	10.10	8.06	6.66	7.48
1856-57	25	27	52	2	4	6	3	1	4	7	3	10	8	8	16	59	50	109	54.55	42.80	97.35	10.00	25.00	16.66	14.66	18.69	16.43	10.13	12.12	11.03
1857-58	29	14	43	13	5	18	1	1	2	2	....	2	7	6	13	65	52	117	57.70	50.31	108.01	56.52	44.66	51.42	12.13	11.92	12.03	7.95	9.37	8.55
1858-59	47	18	65	16	5	21	1	4	5	5	3	8	6	4	10	84	54	138	72.93	56.24	129.17	57.13	31.25	47.73	8.22	7.11	7.74	5.36	5.71	5.49
1859-60	68	24	92	26	7	33	4	3	7	3	2	5	13	5	18	106	61	167	100.68	59.00	159.68	56.52	41.17	52.38	12.91	8.47	11.27	8.55	6.41	7.25
1860-61	64	31	95	42	11	53	5	2	7	2	....	2	12	7	19	109	72	181	109.72	64.81	174.57	68.85	55.55	65.43	10.93	10.80	10.88	7.06	7.61	7.82
1861-62	174	12	186	96	8	104	14	1	15	....	....	....	26	10	36	147	65	212	123.75	65.74	189.49	70.59	42.10	67.09	21.01	15.21	19.00	9.18	11.90	9.81
1862-63	330	25	355	197	6	203	17	1	18	3	3	6	57	4	61	203	76	279	168.41	72.31	240.72	71.89	42.85	70.45	33.84	5.53	25.34	11.95	4.44	10.76
1863-64	484	25	509	282	6	288	69	1	70	5	....	5	67	8	75	354	86	350	205.73	77.66	283.39	66.66	40.00	65.75	42.56	10.30	26.40	11.75	7.92	9.51
1864-65	478	36	514	315	9	324	110	12	122	11	....	11	139	8	147	167	93	200	277.42	33.81	361.23	54.78	31.03	53.64	50.10	9.54	40.69	18.73	6.55	17.01
1865-66	194	28	222	101	5	109	20	7	27	10	1	11	41	12	53	188	96	282	190.92	90.70	281.62	59.42	20.00	54.50	21.47	13.23	18.82	11.35	9.91	10.99
1866-67	88	21	109	45	7	52	11	3	14	11	1	12	19	14	33	188	92	280	189.06	89.46	279.12	52.32	28.00	46.85	10.02	15.65	11.82	6.93	11.96	8.44
1867-68	120	33	153	49	15	64	6	2	8	5	1	6	22	5	27	223	102	328	221.17	96.44	317.61	59.75	65.22	60.95	9.95	5.18	9.50	7.14	4.00	6.23
1868-69	133	35	168	59	11	70	9	6	15	8	2	10	24	9	33	259	109	368	244.55	108.03	352.58	59.00	39.28	54.69	9.81	8.33	9.35	6.70	6.57	6.65
1869-70	146	36	182	32	8	40	16	8	24	11	3	14	15	3	18	331	123	454	294.69	108.08	402.77	43.24	36.37	41.67	5.09	2.77	4.36	3.71	2.05	3.27
1870-71	161	34	195	50	12	62	21	7	28	4	3	7	33	11	44	384	124	508	354.34	121.66	476.00	46.30	36.36	43.97	9.31	9.04	9.24	6.70	7.00	6.78
1871-72	142	44	186	43	8	51	16	13	29	8	1	9	37	7	44	422	139	561	407.21	131.57	538.78	41.34	27.59	38.34	9.09	5.32	8.16	7.04	4.17	6.34
1872-73	153	51	204	49	15	64	23	5	28	3	5	8	32	13	45	468	152	626	431.03	144.11	575.14	45.40	39.47	44.13	7.42	9.02	7.82	5.56	6.84	5.88
1873-74	192	38	230	67	12	79	22	8	30	6	3	9	39	11	50	523	156	682	492.44	151.36	643.80	50.00	35.29	47.02	7.92	7.27	7.76	5.91	5.79	5.88
1874-75	179	51	230	66	9	75	28	22	50	8	3	11	51	7	58	552	166	718	536.46	164.17	700.63	42.13	21.95	38.66	9.50	4.26	8.27	7.23	3.38	6.36
1875-76	166	47	213	67	17	84	26	10	36	1	....	1	48	18	66	570	168	744	564.78	165.59	730.37	47.18	37.78	45.45	8.49	10.87	9.04	6.68	8.45	7.09
1876-77	147	51	198	66	17	83	27	13	40	2	....	2	45	7	52	583	182	765	587.41	176.30	763.71	47.80	45.94	46.89	7.66	3.96	6.80	6.22	3.19	5.52
1877-78	138	44	182	49	11	60	32	9	41	3	4	7	37	9	46	600	193	793	596.82	184.37	781.19	40.49	33.33	38.96	6.19	4.88	5.88	5.13	5.98	4.35
1878-79	169	53	222	68	24	92	30	7	37	3	1	4	51	12	63	617	202	819	619.10	196.70	815.80	44.73	54.54	46.93	8.23	6.10	7.72	6.63	4.87	6.20
1879-80	181	44	225	38	14	52	23	10	33	....	3	3	46	13	59	691	206	897	655.34	196.63	851.97	35.51	35.00	35.37	7.01	6.61	6.92	5.76	5.28	5.65
1880-81	161	62	223	62	10	72	27	9	36	....	6	6	63	18	81	700	225	925	685.37	111.38	896.75	40.78	23.25	36.92	9.19	8.51	9.03	7.39	6.71	7.23
1881-82	178	69	247	62	21	83	31	8	39	2	5	7	74	27	101	709	233	942	697.10	232.88	929.98	36.69	34.43	36.08	10.61	11.59	10.86	8.44	9.18	8.61
1882-83	201	64	265	76	19	95	33	16	49	....	6	6	46	17	63	755	239	994	729.89	235.27	965.16	49.05	31.03	44.13	6.30	7.22	6.52	5.05	5.72	5.22
1883-84	286	64	347	68	13	81	35	8	43	3	1	4	51	16	67	884	262	1,146	797.21	243.27	1,040.48	42.03	34.21	40.51	6.39	6.57	6.44	4.90	5.33	4.99
1884-85	229	91	320	65	24	89	37	12	49	1	1	2	84	21	105	923	295	1,221	902.41	270.89	1,173.34	34.76	41.37	36.32	9.31	7.75	8.94	7.55	5.95	7.19
1885-86	234	69	303	55	22	77	58	15	73	2	3	5	79	23	102	956	301	1,257	936.39	283.23	1,219.62	28.35	34.92	29.96	8.54	8.12	8.36	6.81	6.32	6.69
1886-87	205	62	268	57	15	72	49	17	66	2	1	3	73	19	92	901	311	1,302	956.07	297.36	1,253.43	31.49	28.48	30.90	7.63	6.38	7.34	6.22	5.23	5.99
1887-88	247	71	318	59	10	69	52	14	66	3	1	4	95	25	120	1,029	332	1,361	1,009.55	315.55	1,325.08	28.23	20.00	26.64	9.41	7.92	9.06	7.67	5.64	7.41
1888-89	213	67	280	50	20	70	27	27	54	5	2	6	86	28	114	1,079	322	1,397	1,049.99	323.83	1,373.82	20.94	25.97	28.69	8.19	8.65	8.30	6.92	7.02	6.90

1889-90	274	71	345	39	6	45	43	6	49	....	3	3	112	28	144	1,115	350	1,055	1,108.57	326.53	1,435.10	20.10	13.95	18.12	10.13	9.59	9.76	8.30	7.48	8.04
1890-91	271	81	352	39	30	66	38	15	53	1	1	2	98	30	128	1,253	355	1,608	1,100.62	344.44	1,505.06	20.81	34.47	23.51	8.44	8.71	8.51	6.87	6.93	0.89
1891-92	233	70	303	56	12	68	69	13	82	8	3	11	121	32	153	1,232	365	1,597	1,223.64	348.65	1,575.29	22.05	20.00	21.66	9.87	9.18	9.71	8.14	7.53	8.01
1892-93	231	84	345	57	10	67	46	23	69	4	1	5	140	41	181	1,246	374	1,620	1,255.56	357.02	1,582.58	23.08	13.33	20.81	11.41	11.48	11.44	9.38	9.13	9.32
1893-94	273	88	361	49	13	62	49	16	65	6	....	6	138	29	167	1,277	401	1,681	1,248.16	309.91	1,618.07	20.21	22.41	20.66	11.31	7.84	10.32	9.08	6.27	8.42
1894-95	293	78	371	68	30	98	40	32	72	1	....	1	143	36	179	1,318	381	1,702	1,280.91	386.16	1,667.07	23.98	30.61	28.00	11.16	9.32	10.73	9.10	7.46	8.72
1895-96	278	92	370	74	15	89	39	14	53	7	1	8	146	41	187	1,330	405	1,735	1,290.08	379.25	1,669.33	27.81	21.12	26.40	11.31	10.81	11.20	9.14	8.61	9.02
1896-97	288	88	377	67	17	84	50	44	94	5	....	5	130	32	162	1,367	400	1,767	1,326.08	383.82	1,709.90	26.58	18.27	24.34	9.80	8.33	9.47	8.02	6.49	7.67
1897-98	347	90	437	84	12	293	30	19	49	8	1	9	167	30	197	1,425	428	1,853	1,388.25	409.75	1,798.00	29.03	19.35	27.35	12.03	7.32	10.96	9.74	6.12	8.94
1898-99	498	105	603	173	16	189	59	29	88	38	10	48	158	35	193	1,495	443	1,938	1,438.33	433.51	1,871.84	40.42	17.77	36.48	10.98	8.07	10.31	8.21	6.56	7.85
1899-1900	434	117	551	118	33	151	52	13	65	8	5	13	152	32	184	1,599	477	2,076	1,504.00	444.54	1,948.54	35.75	39.75	36.50	10.10	7.19	9.44	7.87	5.71	7.39
1900-1901	519	136	655	202	33	235	52	25	77	11	6	17	193	33	227	1,670	513	2,176	1,583.33	483.33	2,066.66	44.10	34.02	42.34	12.19	6.83	10.93	9.11	5.38	8.27
1901-2	532	154	686	209	39	218	78	20	98	9	11	20	137	40	177	1,759	557	2,316	1,675.85	518.15	2,194.01	48.25	34.51	45.42	8.17	7.70	8.06	6.24	5.97	6.18
1902-3	551	180	734	211	50	251	103	25	131	19	6	25	189	69	258	1,782	587	2,369	1,737.58	553.58	2,291.16	39.73	33.33	38.32	10.88	12.47	11.26	8.17	9.36	8.45
1903-4	584	182	766	191	42	236	95	35	130	21	13	34	189	54	243	1,877	625	2,492	1,783.08	577.00	2,360.08	38.87	29.16	36.70	10.00	8.66	10.29	7.98	6.50	7.75
1904-5	493	174	667	151	53	204	101	42	143	12	9	21	181	55	236	1,912	639	2,551	1,848.50	598.00	2,446.50	33.70	33.12	33.55	9.79	9.19	9.64	7.66	6.88	7.47
1905-6	421	180	601	173	60	233	94	33	127	29	13	42	150	52	202	1,887	661	2,548	1,887.50	654.50	2,542.00	38.34	37.34	38.07	7.94	7.95	7.94	6.42	6.34	6.40
1906-7	437	182	619	134	45	181	82	52	134	28	12	40	165	51	216	1,913	683	2,596	1,898.10	671.83	2,569.93	32.00	27.50	31.17	8.69	7.60	8.40	7.09	6.05	6.82
1907-8	472	171	643	123	39	162	80	30	110	28	5	33	158	45	203	1,998	735	2,733	1,955.70	699.00	2,654.70	31.52	32.77	32.40	7.93	6.43	7.54	6.54	5.27	6.20
1908-9	517	174	691	133	60	193	52	30	82	35	7	42	185	70	255	2,110	742	2,852	2,061.00	740.66	2,801.66	31.11	34.13	31.99	8.97	9.46	9.10	7.35	7.70	7.44
1909-10	491	154	650	115	56	171	51	20	74	55	26	81	189	71	260	2,193	723	2,916	2,138.91	734.00	2,872.91	23.00	25.89	24.03	8.87	9.67	9.05	7.25	7.92	7.42
1910-11	443	180	623	165	50	215	47	13	60	93	29	122	212	68	280	2,116	746	2,867	2,143.33	740.67	2,884.00	31.73	31.85	31.76	9.89	9.19	9.70	8.01	7.52	7.91
1911-12	543	190	733	100	51	211	33	19	52	72	30	102	258	74	332	2,136	762	2,898	2,124.43	747.32	2,871.75	30.60	29.31	30.01	12.14	9.97	11.52	9.70	7.90	9.24
1912-13	519	197	716	125	49	174	37	20	57	70	34	104	252	69	321	2,201	787	2,988	2,165.36	785.30	2,950.66	35.34	36.79	35.82	11.64	8.78	10.87	9.38	7.19	8.80
1913-14	572	180	752	115	48	163	42	18	60	99	44	133	250	72	322	2,267	795	3,062	2,231.40	794.00	3,025.40	36.32	43.00	38.20	11.21	9.07	10.64	9.01	7.44	8.61
1914-15	471	185	656	103	30	133	50	23	73	71	28	99	265	72	337	2,249	827	3,076	2,225.00	807.50	3,032.50	23.11	19.60	20.72	11.91	8.92	11.12	9.68	7.35	9.05

Sixteen "not insane," 12 males and 4 females, are included with recovered in 1914-15.

Nativity of patients admitted during the year and since opening of the hospital in 1855.

	During year.	Since 1855.
Native born:		
Alabama	1	77
Arkansas	1	42
Arizona		3
California	1	44
Colorado	3	19
Connecticut	4	138
Dakota		16
Delaware	1	43
District of Columbia	106	2,806
Florida		25
Georgia	6	149
Illinois	9	304
Indiana	6	314
Indian Territory		19
Idaho		2
Iowa	4	72
Kansas	3	66
Kentucky	8	310
Louisiana	5	72
Maine	9	168
Maryland	44	1,665
Massachusetts	9	625
Michigan	3	142
Minnesota	1	37
Mississippi	1	72
Missouri	5	188
Montana		3
Nebraska	1	16
New Hampshire	2	99
New Jersey	4	214
New Mexico		5
New York	38	1,355
North Carolina	8	213
Ohio	22	761
Oklahoma	1	4
Oregon		5
Pennsylvania	20	1,126
Rhode Island	2	72
South Carolina	4	90
Tennessee	8	198
Texas	3	87
Utah		3
Vermont	2	82
Virginia	69	2,151
West Virginia	2	101
Wisconsin	5	95
United States	105	1,219
Total	526	15,417
Foreign born:		
Alsace		1
Armenia		3
Austria	8	106
Bahamas		1
Bavaria		17
Belgium		9
Bermuda	1	2
Bohemia	1	12

	During year.	Since 1855.
Foreign born—Continued.		
Brazil		1
British East Indies		8
British Columbia		1
British possessions		3
British West Indies	1	15
Buenos Aires		3
Canada	3	188
Cape Verde Island		1
Chile		2
China		5
Coast of Africa		3
Costa Rica		1
Cuba	1	10
Cyprus		1
Denmark		57
England	7	438
Equador		1
Finland	2	14
France	2	111
Germany	20	1,758
Greece	5	20
Guatemala		1
Holland	1	21
Hungary	2	31
Iceland		1
Ireland	19	2,426
Italy	7	114
Japan	2	16
Korea		1
Malta		3
Mexico		17
New Brunswick		4
Newfoundland		3
New Grenada		1
Norway	3	75
Nova Scotia		25
Panama		1
Philippine Islands	3	12
Poland		37
Portugal		9
Prince Edward Island		3
Prussia	4	42
Porto Rico		3
Roumania		8
Russia	9	112
Hawaiian Islands		3
Saxony		7
Scotland	1	115
Sicily		3
Spain		10
Sweden	1	122
Switzerland	3	34
Turkey		10
Wales		24
West Indies		8
At sea		1
Unascertained	24	608
Total	656	22,148

Ages of patients admitted during the year ended June 30, 1915.

Age.	Male.	Female.	Total.
5 to 15 years		5	5
15 to 20 years	23	5	28
20 to 25 years	58	13	71
25 to 30 years	64	21	85
30 to 35 years	56	25	81
35 to 40 years	56	23	79
40 to 45 years	40	18	58
45 to 50 years	39	18	57
50 to 60 years	34	17	51
60 to 70 years	35	17	52
70 to 80 years	43	16	59
80 to 90 years	12	6	18
Over 90 years	1		1
Unknown	10	1	11
Total	471	185	656

Civil condition of patients admitted during the year ended June 30, 1915.

	Male.	Female.	Total.
Single	279	62	341
Married	126	73	199
Widowed	47	37	84
Divorced	.....	1	1
Unknown	19	12	31
Total	471	185	656

Ages of patients who died during the year ended June 30, 1915.

Age.	Male.	Female.	Total.	Age.	Male.	Female.	Total.
5 to 20 years	2	2	4	50 to 60 years	16	7	23
20 to 25 years	5	1	6	60 to 70 years	48	15	63
25 to 30 years	9	7	16	70 to 80 years	78	12	90
30 to 35 years	20	2	22	80 to 90 years	21	4	25
35 to 40 years	23	8	31	Over 90 years	2	.....	2
40 to 45 years	24	9	33				
45 to 50 years	17	5	22	Total	265	72	337

Duration of mental disease of patients who died during the year ended June 30, 1915.

Age.	Male.	Female.	Total.	Age.	Male.	Female.	Total.
Under 1 month	6	2	8	4 to 6 years	15	7	22
1 to 2 months	17	5	22	6 to 10 years	19	4	23
2 to 4 months	18	7	25	10 to 15 years	16	6	22
4 to 6 months	20	5	25	15 to 20 years	5	5	10
6 to 9 months	24	2	26	20 to 25 years	7	2	9
9 to 12 months	18	4	22	Over 25 years	27	6	23
12 to 18 months	20	4	24				
18 months to 2 years	20	5	25	Total	265	72	337
2 to 4 years	33	8	41				

Ages of patients discharged recovered during year ended June 30, 1915.

Age.	Male.	Female.	Total.
15 to 20 years	8	3	11
20 to 30 years	37	9	46
30 to 40 years	22	6	28
40 to 50 years	16	5	21
50 to 60 years	3	.....	3
60 to 70 years	3	3	6
Over 70 years	2	.....	2
Total	91	26	117

Duration of residence in the hospital of those recovered during the year ended June 30, 1915.

	Male.		Female.		Total.
	White.	Colored.	White.	Colored.	
20 to 30 days	1	1	1	.....	3
1 to 2 months	6	.....	3	1	10
2 to 3 months	6	1	1	1	9
3 to 4 months	8	1	1	1	11
4 to 6 months	17	3	2	1	23
6 to 9 months	22	1	4	1	28
9 to 12 months	5	2	.....	2	9
1 to 2 years	13	1	4	2	20
2 to 4 years	3	.....	.....	1	4
Total	81	10	16	10	117

Nativity of patients admitted during the year and since opening of the hospital in 1855.

	During year.	Since 1855.
Native born:		
Alabama	1	77
Arkansas	1	42
Arizona	.....	3
California	1	44
Colorado	3	19
Connecticut	4	138
Dakota	.....	16
Delaware	1	43
District of Columbia	106	2,806
Florida	.....	25
Georgia	6	149
Illinois	9	304
Indiana	6	314
Indian Territory	.....	19
Idaho	.....	2
Iowa	4	72
Kansas	3	66
Kentucky	8	310
Louisiana	5	72
Maine	9	168
Maryland	44	1,665
Massachusetts	9	625
Michigan	3	142
Minnesota	1	37
Mississippi	1	72
Missouri	5	188
Montana	.....	3
Nebraska	1	16
New Hampshire	2	99
New Jersey	4	214
New Mexico	.....	5
New York	38	1,355
North Carolina	8	213
Ohio	22	761
Oklahoma	1	4
Oregon	.....	5
Pennsylvania	20	1,136
Rhode Island	2	72
South Carolina	4	90
Tennessee	8	198
Texas	3	87
Utah	.....	3
Vermont	2	82
Virginia	69	2,151
West Virginia	2	101
Wisconsin	5	95
United States	105	1,219
Total	526	15,417
Foreign born:		
Alsace	.....	1
Armenia	.....	3
Austria	8	106
Bahamas	.....	1
Bavaria	.....	17
Belgium	.....	9
Bermuda	1	2
Bohemia	1	12

	During year.	Since 1855.
Foreign born—Continued.		
Brazil	.....	1
British East Indies	.....	8
British Columbia	.....	1
British possessions	.....	3
British West Indies	1	15
Buenos Aires	.....	3
Canada	3	188
Cape Verde Island	.....	1
Chile	.....	2
China	.....	5
Coast of Africa	.....	3
Costa Rica	.....	1
Cuba	1	18
Cyprus	.....	1
Denmark	.....	57
England	7	438
Equador	.....	1
Finland	2	14
France	2	111
Germany	20	1,755
Greece	5	20
Guatemala	.....	1
Holland	1	21
Hungary	2	31
Iceland	.....	1
Ireland	19	2,436
Italy	7	114
Japan	2	16
Korea	.....	1
Malta	.....	3
Mexico	.....	17
New Brunswick	.....	4
Newfoundland	.....	3
New Grenada	.....	1
Norway	3	75
Nova Scotia	.....	26
Panama	.....	1
Philippine Islands	3	13
Poland	.....	37
Portugal	.....	9
Prince Edward Island	.....	3
Prussia	4	42
Porto Rico	.....	2
Roumania	.....	3
Russia	9	112
Hawaiian Islands	.....	3
Saxony	.....	7
Scotland	1	115
Sicily	.....	3
Spain	.....	10
Sweden	1	123
Switzerland	3	34
Turkey	.....	10
Wales	.....	24
West Indies	.....	3
At sea	.....	1
Unascertained	24	608
Total	656	22,143

Ages of patients admitted during the year ended June 30, 1915.

Age.	Male.	Female.	Total.
5 to 15 years	.....	5	5
15 to 20 years	23	5	28
20 to 25 years	58	13	71
25 to 30 years	64	21	85
30 to 35 years	56	25	81
35 to 40 years	56	23	79
40 to 45 years	40	18	58
45 to 50 years	39	18	57
50 to 60 years	34	17	51
60 to 70 years	35	17	52
70 to 80 years	43	16	59
80 to 90 years	12	6	18
Over 90 years	1	.....	1
Unknown	10	1	11
Total	471	185	656

Civil condition of patients admitted during the year ended June 30, 1915.

	Male.	Female.	Total.
Single	279	62	341
Married	126	73	199
Widowed	47	37	84
Divorced	.....	1	1
Unknown	19	12	31
Total	471	185	656

Ages of patients who died during the year ended June 30, 1915.

Age.	Male.	Female.	Total.	Age.	Male.	Female.	Total.
5 to 20 years	2	2	4	50 to 60 years	16	7	23
20 to 25 years	5	1	6	60 to 70 years	48	15	63
25 to 30 years	9	7	16	70 to 80 years	78	12	90
30 to 35 years	20	2	22	80 to 90 years	21	4	25
35 to 40 years	23	8	31	Over 90 years	2	.....	2
40 to 45 years	24	9	33				
45 to 50 years	17	5	22	Total	265	72	337

Duration of mental disease of patients who died during the year ended June 30, 1915.

Age.	Male.	Female.	Total.	Age.	Male.	Female.	Total.
Under 1 month	6	2	8	4 to 6 years	15	7	22
1 to 2 months	17	5	22	6 to 10 years	19	4	23
2 to 4 months	18	7	25	10 to 15 years	16	6	22
4 to 6 months	20	5	25	15 to 20 years	5	5	10
6 to 9 months	24	2	26	20 to 25 years	7	2	9
9 to 12 months	18	4	22	Over 25 years	27	6	23
12 to 18 months	20	4	24				
18 months to 2 years	20	5	25	Total	265	72	337
2 to 4 years	33	8	41				

Ages of patients discharged recovered during year ended June 30, 1915.

Age.	Male.	Female.	Total.
15 to 20 years	8	3	11
20 to 30 years	37	9	46
30 to 40 years	22	6	28
40 to 50 years	16	5	21
50 to 60 years	3	.....	3
60 to 70 years	3	3	6
Over 70 years	2	.....	2
Total	91	26	117

Duration of residence in the hospital of those recovered during the year ended June 30, 1915.

	Male.		Female.		Total.
	White.	Colored.	White.	Colored.	
20 to 30 days	1	1	1	.....	3
1 to 2 months	6	.....	3	1	10
2 to 3 months	6	1	1	1	9
3 to 4 months	8	1	1	1	11
4 to 6 months	17	3	2	1	23
6 to 9 months	22	1	4	1	28
9 to 12 months	5	2	.....	2	9
1 to 2 years	13	1	4	2	20
2 to 4 years	3	.....	.....	1	4
Total	81	10	16	10	117

Forms of mental disease of patients admitted during the year ended June 30, 1915.

	Male.		Female.		Total.
	White.	Colored.	White.	Colored.	
Infection-exhaustion psychosis:					
Symptomatic psychosis			1		1
Toxic psychosis—					
Exogenous			1		1
Endogenous	1	2		3	6
Alcoholic psychosis	5	1			6
Korsakow's psychosis			1		1
Psychosis associated with organic brain disease	4		1	4	9
Cerebral arteriosclerosis—					
Confusion	1		1		2
Dementia	33	8	10	1	52
Depression			3	1	4
Excitement	1				1
Paranoid state	1		2		3
Cerebral syphilis	10	9	1	3	23
Psychosis associated with brain tumor		2			2
Traumatic psychosis	1				1
Psychosis associated with epilepsy	5	6	1	3	15
General paresis	45	22	4	7	78
Taboparesis	1				1
Senile dementia	35	7	14	3	59
Dementia præcox:					
Hebephrenic	16	8			24
Catatonic	4	4			8
Paranoid	6	2		1	9
Undifferentiated	130	10	36	26	202
Manic-depressive psychosis	12		14	7	33
Paranoia		1	3		4
Psychogenic psychoses		1			1
Depression	2		1		3
Prison psychoses	3	1		1	5
Hysteria	1				1
Defective states:					
Idiocy				1	1
Imbecility	1	5	3	2	11
Moronism	1	1			2
Constitutional inferiority	1				1
Constitutional psychopathy	5	1	1	1	8
Undifferentiated psychoses	6	4		3	13
Confusion			1	1	2
Depression	5		2	2	9
Excitement		2	1	2	5
Paranoid state	20	5	6	2	33
Unclassified psychosis	1				1
Acute alcoholism	1				1
Chronic alcoholism	4	1			5
Morphinism	1				1
Not insane	2	3	1	2	8
Total	365	106	109	76	656

Forms of mental disease in patients discharged as recovered during the year ended June 30, 1915.

	Male.		Female.		Total.
	White.	Colored.	White.	Colored.	
Toxic psychosis:					
Chronic alcoholism	1	2		1	4
Delirium tremens	1				1
Alcoholic hallucinosis	1				1
Drugs	1		1		2
Manic depressive psychosis	8	1	6	2	17
Dementia præcox:					
Hebephrenic form	12	2	3	3	20
Catatonic form	2				2
Paranoid form	9		1		10
Undifferentiated	32	2	3	1	38
Excitement, undifferentiated	2			1	3
Depression:					
Symptomatic	1				1
Psychogenic	1				1
Undifferentiated	1				1
Prison psychosis	3	1			4
Psychosis associated with—					
Cerebral syphilis	1			1	2
Arteriosclerosis	1	1	2		4
Psychoneurosis	1				1
Epilepsy	2	1			3
Imbecility	1			1	2
Functional neurosis					
Total	81	10	16	10	117

Detailed statement of receipts and expenditures for the fiscal year ended June 30, 1914—Additional.

RECEIPTS.

On hand as stated in last annual report:		
Support		$2,500.84
Buildings and grounds, 1914		49,313.51
Buildings and grounds, continuous appropriation		6,054.56
Power, heating, and lighting		49,738.87
Miscellaneous receipts		94.19
Disallowance		.15
		107,702.12

EXPENDITURES.

Furniture and bedding:		
Bedding	$458.84	
Table linen	109.23	
		568.07
Dry goods and clothing:		
Clothing material	1,169.30	
Shoes and slippers, men's	309.12	
Shoes and slippers, women's	63.75	
		1,542.17
Farm and garden: Horticultural supplies		218.20
Miscellaneous messages		.20
Buildings and grounds:		
Roadways, grading, and walks	521.34	
General repairs and improvements	5,091.67	
Barns and piggeries	13,498.62	
Provision for criminal insane	22,604.15	
Power, heating, and lighting plant	8,841.00	
		50,556.78

Reappropriated:	
Power, heating, and lighting plant	$40,897.87
Provision for criminal insane	2,795.61
Barns and piggeries	4,524.81
Carried to surplus, United States Treasury, buildings and grounds, continuous appropriation	6,054.56
Balance in United States Treasury:	
Support	266.54
Buildings and grounds, 1914	277.31
	107,702.12

Expenditures of the Government Hospital for the Insane, by classes, for the fiscal year ended June 30, 1914.—Additional.

Date.	Item.	Amount.
	PAID BY AUDITOR.	
1914.		
Sept. 8	R. P. Clarke Co.:	
	Class 56	$458.84
	Class 28	109.23
8	William Hahn & Co.:	
	Class 38	309.12
	Class 39	63.75
	R. P. Clarke Co., class 33	1,162.30
Dec. 15	Henry F. Michell Co., class 47	218.20
Sept. 28	The Western Union Telegraph Co., class 57	.20
Aug. 12	Miscellaneous trust fund deposits, District of Columbia, class 71	7.35
Sept. 28	Thomas Somerville Co., class 71	176.24
	L. A. Clarke & Son, class 73	1,030.96
Oct. 3	James L. Marshall, class 75	5,542.54
13	Andrew Murray, class 77	7,311.57
15	W. A. H. Church, class 73	882.79
16	Thomas Somerville Co., class 73	2,652.30
	Miscellaneous trust fund deposits, District of Columbia, class 71	2.10
Nov. 20	Andrew Murray, class 77	6,142.40
24	James L. Marshall, class 75	4,344.08
Dec. 15	Sprague Electric Works of General Electric Co., class 78	3,500.00
1915.		
Jan. 5	.....do	3,500.00
12	Merchants' Transfer & Storage Co., class 78	1,056.00
Feb. 11	National Mortar Co.:	
	Class 71	20.50
	Class 73	15.20
Mar. 23	McIntosh & Seymour Corporation, class 78	785.00
	PAID BY HOSPITAL.	
1914.		
Sept. 1	The Washington Herald Co., voucher No. 360, class 75	12.00
4	James L. Marshall, voucher No. 362, class 75	3,600.00
14	Andrew Murray, voucher No. 366, class 77	9,150.18
22	National Mortar Co., voucher No. 479, class 73	510.42
	National Mortar Co., voucher No. 480, class 71	315.15
	Total	52,885.42

Detailed statement of receipts and expenditures for the fiscal year ended June 30, 1915.

RECEIPTS.

Appropriated for:	
Support	$284,943.00
District of Columbia patients	378,507.09
Board of Marine Hospital Service patients	10,139.93
Buildings and grounds, 1915:	
General repairs and improvements	55,000.00
Roadways, grading, and walks	5,000.00
Barns and piggeries (reappropriated)	4,524.81
Provision for criminal insane (reappropriated)	2,795.61
Board of patients	46,689.65
Sale of stock, etc	16,336.68
Power, heating, and lighting, 1915: Power, heating, and lighting plant (reappropriated)	40,897.87
Sale and exchange of old material	16,850.00
	861,684.64

EXPENDITURES.

Provisions and stores:			
Class 1.	Farinaceous foods	$35,249.21	
2.	Yeast	720.57	
3.	Meats, fresh	63,601.03	
4.	Poultry	3,368.86	
5.	Meats, salt and smoked	35,538.46	
6.	Fish, fresh	3,015.12	
7.	Fish, salt	3,637.97	
8.	Vegetables, fresh	6,748.83	
9.	Vegetables, canned	2,712.49	
10.	Fruits, fresh	494.80	
11.	Fruits, dried	3,592.61	
12.	Preserves and jellies		
13.	Dairy products	26,496.05	
14.	Groceries, wet	4,618.57	
15.	Groceries, dry	27,733.88	
16.	Condiments	215.08	
17.	Laundry supplies	12,004.54	
18.	Crockery and china	1,340.85	
19.	Tin and iron ware	698.83	
20.	Cutlery and plated ware	99.66	
21.	Household supplies	2,364.29	
22.	Woodenware		
23.	Toilet articles	1,351.64	
24.	Fuel	67,653.57	
			$303,256.91
Furniture and bedding:			
Class 25.	Furniture	1,311.11	
26.	Bedding	9,708.30	
27.	Window furniture	377.58	
28.	Table linen	1,115.05	
29.	Upholstery and furniture material	10.50	
30.	Sewing-machine supplies	.85	
31.	Carpets, etc	201.20	
			12,724.59
Dry goods and clothing:			
Class 32.	Clothing, new	3,026.75	
33.	Clothing material	6,846.79	
34.	Hats, straw	116.87	
35.	Hats, felt	291.60	
36.	Hosiery	804:34	
37.	Haberdashery	322.75	
38.	Shoes and slippers, men's	5,155.70	
39.	Shoes and slippers, women's	634.34	
			17,199.14
Medical supplies:			
Class 40.	Medical supplies	4,185.94	
41.	Surgical supplies	1,015.86	
42.	Laboratory supplies	244.13	
			5,445.93
Farm and garden:			
Class 43.	Wagons and harness	504.68	
44.	Farm and garden implements	787.96	
45.	Lawns, roads, and grounds		
46.	Farm supplies	37.50	
47.	Horticultural supplies	1,409.49	
48.	Stable maintenance	63.56	
49.	Live stock	2,132.00	
50.	Farm feed	8,871.36	
51.	Dairy feed	22,425.61	
52.	Poultry feed	745.60	
			36,977.76

Summary of expenditures.

Current expenses:	
Salaries and wages	$332,896.37
Clothing	17,199.14
Subsistence	291,252.37
Ordinary repairs	13,567.26
Office, domestic, and outdoor expenses	72,899.41
	727,814.55
Extraordinary expenses:	
New buildings, land, etc	18,096.34
Permanent improvements to existing buildings	50,370.20
Total	68,466.54
Grand total	796,281.09

	Male.	Female.	Total.
Patients at beginning of fiscal year	2,267	795	3,062
Patients received during the year	471	185	656
Patients discharged and died during the year	489	153	642
Patients remaining at end of fiscal year	2,249	827	3,076
Daily average number of patients during year	2,225	807	3,032
Average number of officers and employees during year	555	305	860

REPORT OF THE COLUMBIA INSTITUTION FOR THE DEAF.

COLUMBIA INSTITUTION FOR THE DEAF,
Kendall Green, Washington, D. C., September 7, 1915.

SIR: The number of deaf pupils and students remaining in the institution on July 1, 1914, was 110; admitted during the year, 41; total, 151; admitted for the school year 1915–16, 42. From July 1, 1914, to July 1, 1915, there were under instruction 85 males and 66 females; a total of 151; of whom 108 have been in the collegiate department, representing 34 States, the District of Columbia, Canada, and Wales; and 43 in the primary department. Of these, 35 were admitted as beneficiaries of the District of Columbia. During the fiscal year 32 were discharged from the institution by graduation and otherwise.

A list of the names of students and pupils who have been under instruction in this institution since July 1, 1914, including those admitted for the school year 1915–16, will be found appended to this report.

HEALTH.

One of our students, William F. Miller, died of typhoid fever at his home in Baltimore in October. He contracted the disease during the vacation.

A case of typhoid fever appeared among the college women early in the fall. The patient was promptly removed to George Washington University Hospital, where she was successfully treated. All students, pupils, and employees taking meals at the institution were vaccinated with antityphoid serum. No further cases developed, and the origin of the disease was not ascertained by the District Health Department.

In the spring a case of diphtheria was discovered among the young women of the college. It was impossible to remove the young lady to the hospital, but she was isolated in the hospital room in Fowler Hall with a nurse. Careful examinations soon showed another case of diphtheria in a very mild form. After a short quarantine of the students in Fowler Hall recitations were continued, with frequent examination of all suspects. No further cases developed, and both of the young women were successfully treated and cured before the close of college.

In the Kendall School there were a number of cases of inflammation of the middle ear, some of them involving the mastoid process. All of these were dealt with successfully.

Otherwise the general health of the students and pupils was good.

A well equipped dental room, opened in 1914 as an experiment, was put in charge of Dr. J. A. Taylor for the whole of the school year just completed, and work was done regularly for all pupils and students. While there is no definite proof of the improvement of the health of the students and pupils on account of this work, there is no doubt of its good influence on the general physical condition of all.

CHANGES IN THE CORPS OF OFFICERS AND TEACHERS.

Prof. Allan B. Fay, for 17 years a member of the faculty of Gallaudet College, died suddenly on July 5, 1915. Prof. Fay's valuable services to the institution were enhanced by long association with the deaf and by the best traditions of the education of the deaf handed down to him from father and grandfather. Mr. Victor O. Skyberg has been appointed a member of the faculty and instructor in Latin and natural science to take up the teaching work of the late Prof. A. B. Fay.

Mr. Julius J. Heimark, physical director and instructor in natural science, resigned to study medicine. His place as instructor has been filled by the appointment of Mr. Frederick H. Hughes, M. A., Gallaudet College. 1914, recently teacher in the Alabama School.

Mr. O. L. McIntire, B. A., Westminster College, has been placed temporarily in charge of the gymnastic work of the college men.

Miss Beulah Stebbins has been appointed instructor in art and manual training to take the place of Miss Grace Stone, resigned.

Mrs. Cora V. Troup has been promoted to the position of boys' matron in the Kendall School in the place of Miss Rose E. Bramble, resigned.

Mr. Norman Hicks, boys' supervisor in the Kendall School, resigned to go into teaching, and his place has been filled by the appointment of Mr. Cyril E. Hansell, until recently a teacher in the Maryland School for the Colored Deaf.

Miss Jennie Kennedy has been appointed girls' supervisor in the Kendall School.

COURSE OF INSTRUCTION.

The course of instruction has been carried out as reported in the fifty-sixth annual report. A much more thorough course, however, has been given during the past year in business methods and a limited number of students have been taught the elements of typewriting. Four students took extended special work in chemistry and 17 in various branches of agriculture.

LECTURES.

The following special lectures have been delivered during the year:

IN THE COLLEGE.

Nietzsche and Treitschke	Vice President Fay.
Two Views of the Northwest	Dr. Hotchkiss.
Henry Laurens	Dr. Draper.
Medical Entomology	Dr. Ely.
The Greatest of the Allies, but the least known	Prof. Day.
Dr. Grenfell of Labrador	Prof. A. B. Fay.
The Ghost of Berwick	Prof. Allison.
Superstitions	Miss Peet.

IN THE KENDALL SCHOOL.

Robinson Crusoe	Mr. Tucker.
Ichabod Crane	Mr. Moore.
Little Lord Fauntleroy	Miss McKee.
Enoch Arden	Miss Sims.
The Little Lame Prince	Miss Dougherty.
King of the Golden River	Miss Nelson.
Short History Stories	Mr. Steed.

FINANCES.

Receipts and expenses.

	Receipts.	Expenses.
HOUSEKEEPING DEPARTMENT.		
Salaries		$5,289.96
Milk		15.05
Meat	$149.21	5,438.61
Groceries	.60	3,354.97
Fruit and vegetables		1,326.69
Dairy produce		2,246.09
Bread and crackers		1,599.74
Fish		242.42
Prepared desserts		391.92
Ice		507.19
Supplies	.65	716.44
Equipment		262.67
Sundries		56.96
Board	17.78	
Total	168.24	21,520.73
ADMINISTRATION AND OFFICE.		
Salaries		6,937.60
Supplies		150.33
Equipment	45.00	105.91
Communication service	52.12	728.53
Printing		194.66
Auditing and account books		349.35
Sundries		20.12
Total	97.12	8,487.30
GROUNDS.		
Salaries		3,554.64
Supplies		332.06
Equipment		141.66
Board and care of horses		9.00
Sundries	263.08	720.83
Total	263.08	4,758.19
LAUNDRY.		
Salaries		1,223.64
Supplies		213.71
Equipment		5.79
Sundries		14.30
Total		1,457.44
FARM.[1]		
Salaries		2,442.15
Feed	2.79	1,708.92
Plants and seeds	.45	115.96
Supplies	3.48	183.12
Live stock		1,474.21
Equipment	4.00	134.61
Care of live stock	2.00	102.25
Teaming		15.00
Repairs		78.19
Board and laundry		.75
Sundries		33.32
Milk	409.16	
Fruit and vegetables	14.00	
Poultry and eggs	44.41	
Live stock	556.08	
Sundries	6.50	
Total	1,042.87	6,288.48
GALLAUDET COLLEGE.		
Salaries		21,635.51
Library supplies and equipment		317.60
Laboratory supplies and equipment		183.92
Supplies		329.13
Equipment	.50	620.86
GALLAUDET COLLEGE—contd.		
Medical expenses	$113.20	$1,286.06
Sundries		42.63
Total	113.70	24,425.72
NORMAL DEPARTMENT.		
Salaries		1,309.85
GARAGE.		
Salaries		627.00
Gasoline and oil	4.57	115.45
Supplies	.65	234.47
Equipment		45.78
Repairs		472.88
Sundries		9.80
Total	5.22	1,505.38
IMPROVEMENTS, RENEWALS, AND REPAIRS.		
Salaries	2.45	4,315.60
Materials and supplies	31.65	2,232.25
Equipment		37.52
Contracts	1.20	2,974.09
Sundries		10.60
Heat, light, and power plant		21,015.00
Total	35.30	30,584.46
KENDALL SCHOOL.		
Salaries		8,897.70
Supplies		569.31
Equipment		770.22
Medical expenses	22.23	588.33
Sundries	43.50	121.44
Total	65.73	10,947.00
LIGHT, HEAT, AND POWER.		
Salaries		1,603.54
Coal		3,273.74
Gas	5.28	1,145.63
Supplies		227.28
Equipment		267.16
Sundries		50.20
Total	5.28	6,567.55
MISCELLANEOUS.		
Traveling	3.41	371.31
Students' merchandise	5.28	485.37
Presents, subscriptions, and advances	60.00	79.48
Sundries	2.50	22.30
United States appropriations	109,250.00	
Tuition, Gallaudet College	2,975.00	
Tuition, Kendall School	3,475.00	
Equipment, produce, and junk sold	404.69	
Students' merchandise	409.70	
Sundries	82.67	
Total	116,728.25	958.46
Total receipts	118,524.79	
Total expenses		118,810.56
Cash on hand July 1, 1914	1,130.84	
Cash on hand June 30, 1915		845.07
Grand total	119,655.63	119,655.63

[1] In addition the housekeeping department received produce valued at $3,877.86, as follows: Milk, $2,953.54; meat, $563.59; fruit and vegetables, $176.58; dairy produce, $164.15.

Statement of the treasurer for the fiscal year ending June 30, 1915.

GENERAL FUND.

1914.			
July 1.	By balance		$859.76
	By 2 Chesapeake & Potomac Telephone Co. coupons, at $25		50.00
	By 8 Chesapeake & Ohio Railway Co. coupons, at $22.50		180.00
	By principal, $500, and interest due Oct. 1, 1914, $12.50, on Columbia Railway Co. of the District of Columbia bond		512.50
	By 1 Riggs Realty Co. coupon (this bond was purchased with proceeds of Columbia Railway Co. bond)		12.50
	By six months' interest to Dec. 31, 1914, on balance in Union Trust Co.		15.99
	By six months' interest to June 30, 1915, on balance in Union Trust Co.		18.02
Oct. 1.	To Union Trust Co., for one Riggs Realty Co. 5 per cent 3/30 year coupon bond	500.00	
Dec. 31.	To G. X. McLanahan, bookkeeping expenses, treasurer's office, to Dec. 31, 1914	50.00	
1915.			
Mar. 11.	To American Surety Co. of New York, premium on bond of treasurer to Mar. 19, 1916	25.00	
Apr. 6.	To Union Trust Co., for rent of safe deposit box to Apr. 6, 1916	4.00	
June 30.	To balance	1,069.77	
		1,648.77	1,648.77

MANUAL LABOR FUND.

1914.			
July 1.	By balance		$187.90
	By 8 Southern Railway Co. coupons at $25		200.00
	By check, Columbia Institution for the Deaf, Louis L. Hooper, disbursing agent, refund of unused portion of check for $514.60, dated Feb. 17, 1914, to Percival Hall		200.00
	By 2 Chesapeake & Ohio Railway Co. coupons, at $22.50		45.00
			632.90
1915.			
June 30.	To balance	632.90	

MEMORIAL ART FUND.

1914.			
July 1.	By balance		$162.68
	By 3 United States 1898 coupons, at $0.75		2.25
	By 1 Washington Railway & Electric Co. coupon		10.00
			174.93
1915.			
June 30.	To balance	174.93	

Summary of balances June 30, 1915.

General fund	$1,069.77
Manual labor fund	632.90
Memorial art fund	174.93
Total	1,877.60

ESTIMATES FOR THE FISCAL YEAR ENDING JUNE 30, 1917.

The following estimates for the fiscal year to end June 30, 1917, have already been submitted:

For the support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, $84,700.

For repairs to the buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, $6,000.

For sewer from farm to West Virginia Avenue, for machinery in shop, for small engine and generator, for scales, for new hog house, and repairs to present sheds for care of tools, and equipment at farm, $4,000.

For the removal of the college women's dormitory and the construction, equipment, and furnishing a new dormitory to replace it, and for necessary repairs to walks and grading of grounds adjacent to said dormitory, $90,000.

A small addition of $1,500 is asked for current expenses to provide for the salary of a storekeeper, for small increases in present salaries, and for probable increased household expenses, due to the increased cost of food and supplies and to a larger number of students.

The small new items asked for, totaling $4,000, are very desirable for properly taking care of and equipping the institution. There is at present an open sewer 700 feet long from the vicinity of the farm buildings to West Virginia Avenue. This is without doubt a menace to health and should be turned into a terra-cotta sewer and connected with the new line now draining West Virginia Avenue.

The equipment of a 4-horsepower motor with bandsaw and other attachments for labor saving would be a great economy in our carpenter shop, as a great deal of hand labor must now be done during the summer in making repairs to the institution buildings.

A small engine of about 25 horsepower with direct connected generator of 15 kilowatts would be most desirable in our power plant for the economical running of night lines during the college year and for the supplying of power in the shop, kitchen, and laundry during the summer months.

The present method of weighing coal, hay, etc., delivered to the institution is wasteful and clumsy. It is necessary at present to send a weigher and inspector to the coal yards for every order of coal, no matter how small. Hay, grain, etc., must be weighed after its arrival in small quantities on scales whose limit is a few hundred pounds. The installation near our power house of standard scales with capacity for weighing coal and other heavy loads of goods purchased by the institution would enable our employees to check quickly and accurately all such purchases.

While the main barn of the institution is in good condition, the tool house and sheds connected with it are greatly in need of repairs, and either in connection with them or a short distance from them we need a building for the hogs, which are the most profitable product of the farm. One thousand dollars would be sufficient to provide such a building and make improvements and repairs in the old sheds.

The request for a new dormitory in place of the present building used for housing our college women and others has been before Congress for some time. It has been recognized by all who have examined the condition of this building that it is a waste of money to repair it and that its condition is a dangerous one. Not only is it overcrowded, but in case of fire, especially at night, it would be almost impossible to save all of those living in this building.

EXERCISES OF PRESENTATION DAY.

The public anniversary of the collegiate department was held in the college chapel on Wednesday, May 5. Rev. Samuel H. Greene, D. D., of the Calvary Baptist Church, offered the opening prayer.

The orations given by members of the graduating class were as follows:

Women and War, by Ruia Ursulla Burt, of Nebraska.
Universal Peace Movement, by Ralph Raymond Decker, of Kansas.
Benefits of Good Reading, by Frederick Antonio Moore, of Kansas.

An oil painting of President Emeritus Edward Miner Gallaudet, painted by Mr. William B. Closson, was presented to the college by Dr. John B. Hotchkiss in behalf of the Alumni Association, and accepted for the board of directors by President Hall.

Candidates for degrees were presented by Dr. Charles R. Ely, Vice President Fay, and by President Hall, as follows:

For the degree of master of arts.

Edith Mabel Nelson, B. A., 1914, Gallaudet College.
Alpha William Patterson, B. A., 1914, Gallaudet College.

For the degree of bachelor of pedagogy.

NORMAL FELLOW.

Frances McKee, B. A., Synodical College, Missouri.

For the degree of bachelor of arts.

Ruia Ursulla Burt.
Vernon Leslie Butterbaugh.
Wallace Dickinson Edington.
Edward Shaffer Foltz.
Frederick Antonio Moore.

For the degree of bachelor of science.

Ralph Raymond Decker.
John Marinius Jacobsen.

For the degree of bachelor of letters.

Stacia Barbara Kuta.

For certificates.

NORMAL STUDENTS.

Julia Penn Dougherty, Englewood High School, Illinois.
Russell Stephen Willingford Moore, Chase High School, Kansas.
Josie Eleanor Sims, Kentucky College for Women, Danville.
Walter Jones Tucker, Paris High School, Kentucky.

Hon. Frederick L. Siddons, associate justice of the supreme court of the District of Columbia, addressed the graduating class.

The benediction was pronounced by Rev. Daniel E. Moylan, Methodist minister to the deaf, Baltimore.

CONFERRING OF DEGREES.

On the closing day of the term, June 23, 1915, degrees and certificates were conferred in accordance with the recommendations of presentation day with two exceptions. Mr. Alpha William Patterson was not granted a degree.

Miss Josie E. Sims, of the normal department, being obliged to return home before the completion of her course, the granting of her certificate was deferred.

All of which is respectfully submitted.

PERCIVAL HALL,
President.

THE SECRETARY OF THE INTERIOR.

APPENDIX A.

FACULTY OF GALLAUDET COLLEGE, 1914–15.

Emeritus president and professor of moral and political science.—Edward Miner Gallaudet, Ph. D., LL. D.
President and professor of applied mathematics and pedagogy.—Percival Hall, M. A., Litt. D.
Vice-president and professor of languages.—Edward Allen Fay, M. A., Ph. D., Sc. D.
Professor of English and history.—John Burton Hotchkiss, M. A., Litt. D.
Professor of mathematics and Latin.—Amos G. Draper, M. A., Litt. D.
Professor of natural science.—Charles Russell Ely, M. A., Ph. D.
Professor of Latin.—Allan B. Fay, M. A.
Professor of physics and biology.—Herbert E. Day, M. A.
Assistant professor of mathematics and engineering.—Isaac Allison, E. E.
Instructor in English and in charge of college women.—Elizabeth Peet.
Librarian and instructor in English and mathematics.—Helen Northrop, B. A.
Physical director and instructor in natural science.—Julius J. Helmark, M. A.
Instructor in drawing.—Arthur D. Bryant, B. Ph.
Instructor in agriculture.—Harley D. Drake, B. A.

DEPARTMENT OF ARTICULATION AND NORMAL INSTRUCTION, 1914–15.

Professor in charge.—Percival Hall, M. A., Litt. D.
Instructors.—Lyman Steed, M. A., Annie E. Jameson, Sarah H. Porter, M. A.
Normal fellow.—Frances McKee, B. A., Synodical College, Missouri.
Normal students.—Julia Penn Dougherty, Englewood High School, Illinois; Russell Stephen Willingford Moore, Chase High School, Kansas; Josie Eleanor Sims, Kentucky College for Women, Danville; Walter J. Tucker, Paris High School, Kentucky.

FACULTY OF THE KENDALL SCHOOL, 1914–15.

President.—Percival Hall, M. A., Litt. D.
Principal.—Lyman Steed, M. A.
Instructors.—Helen Fay; Musa Marbut, M. A.; Edetha Williams, B. A.; Grace D. Ely; Mary Burch.
Instructor in art and manual training.—Ruth Stone,[1] Mrs. Gertrude D. Hooper.
Instructor in cooking and sewing.—Agnes Suman.

DOMESTIC DEPARTMENT, 1914–15.

Supervisor and disbursing agent.—Louis L. Hooper, M. A.
Attending physician.—Harry H. Donnally, M. D.
Dentist.—J. A. Taylor, D. D. S.
Matron Gallaudet College.—Mary Helen Ferris.
Matron Kendall School.—Harriet Van Deventer.
Boys' matron Kendall School.—Rose E. Bramble,[1] Mrs. Cora V. Troup.
Boys' supervisor.—Norman Hicks.
Girls' supervisor.—Mrs. Cora V. Troup,[1] Lillian Stauffer.
Gardener.—Edward Mangum.
Farmer.—Harley D. Drake, B. A.

[1] Resigned.

APPENDIX B.

CATALOGUE OF STUDENTS, BY STATES.

IN THE COLLEGE.

Alabama:
- Grace, William F.[1]
- Harper, Florence.

Arkansas:
- Daves, Lula.
- Patterson, Alpha W.
- Smith, James M.
- Wade, Sarah Frances.
- Wallace, Mamie.[2]

California:
- Nelson, Edith M.
- Vallant, Walter.[1]
- Whitworth, George.[1]

Colorado:
- Barnett, Vern.[1]
- Braddock, Guilbert.
- Gilbert, Foster D.[3]
- Olinger, Hugh.[1]
- Studt, Ada R.
- Wilson, Powell.[1]

Connecticut:
- Rockwell, Walter C.
- Sullivan, James A.

District of Columbia:
- Edington, Wallace D.
- Lynch, Ulen.
- McAvoy, Monica.
- Stegemerten, Henry J.

Florida:
- Austin, Henry S.
- Rou, Raymond.
- Townsend, William H.

Idaho:
- Thompson, Clifford M.

Illinois:
- Burns, Robey S.
- Munger, Kenneth.[1]
- Peard, Forrest.

Indiana:
- Schowe, Ben M.

Iowa:
- Pearson, Mabel S.
- Rasmussen, Arthur S.
- Rendall, J. Leonard, jr.
- Schmidt, Charles J.
- Waggoner, Mildred.[1]

Kansas:
- Atkins, Ruth.
- Bradshaw, Mamie.
- Davis, LeRoy J.
- Decker, Ralph.
- Dohrmann, Frank.
- Ferguson, Gerald.
- Foltz, Edward S.
- Harms, George C.
- Hodges, Maude E.[1]
- Jespersen, Caroline.
- Loucks, Hazel.[1]
- Moore, Frederick A.
- Riley, Sylvan J.
- Sawhill, Edith.[1]
- Sawtelle, Lorraine.
- Smith, Harley W.

Kentucky:
- Fowler, Amy.
- Hertzman, Roy.[1]
- Martin, Ashland D.

Louisiana:
- Courrege, Armand.

Maryland:
- Hetzler, H. Wroth.
- Miller, William F.[3]

Massachusetts:
- Light, J. Stanley.[3]

Minnesota:
- Doran, Ethel.
- Jacobsen, John M.
- Post, Eunice.
- Spong, Hilda.

Mississippi:
- Gwin, Lilly.
- Pearson, Lawrence S., jr.
- Netterville, Irvin T.[1]

Missouri:
- Claussen, Hugo.
- Ladd, Cecil.
- Pfaff, Dorothy.
- Roberts, Lucille.
- Shannon, Russell R.

Montana:
- Gibson, Wallace K.

[1] Admitted for school year 1915–16.
[2] Not included in last report.
[3] Died October, 1914.

Nebraska:
Andrewjeski, Frank A.
Burt, Rula U.
Butterbaugh, Vernon L.
Clark, Gladys.
Cowen, Ella M.
Cusenden, T. Scott.
Hladik, Emil.
Kuta, Stacia B.
Marshall, Charles C.
Newell, Jean.
Newman, Harold G.
Olson, Regina.
Pearson, Ellen.
Trenke, Oscar M.
Weseen, Effie.[1]
New York:
Pulver, Henry J.
Pusrin, Sara H.[1]
Tredwell, Sara.
North Carolina:
Boggs, Edith.
Jones, Jennie.[1]
North Dakota:
Billigmeier, Herbert.[1]
De Lance, John.[1]
Haley, Wendell.[1]
Heupel, Philip.
Schlenker, Emil.[1]
Ohio:
Bamberg, Eva.[1]
Bower, Lloyd.[1]
Conarroe, Grace.[1]
Jecmen, Frances.[1]
Myers, Veda.[1]
Pilliod, Norbert.
Rumsey, Frances.
Woudrack, John.
Oklahoma:
Harold, Ethel.
Oregon:
Kau, Marguerite.
Mokko, Lilly.
Pennsylvania:
Davies, George.[1]
Sadelmyer, Louise.
Sterck, Emily.[1]
South Dakota:
Holsington, Flossie.
Tennessee:
Olinger, Oscar.
Osborne, T. Watson.
Ozier, Claude V.
Texas:
Caps, William J.
Hinsley, Georgia.[1]
Stevens, Kelly.[1]
Varley, Teet (Miss).[1]
Utah:
Hunter, Marie[1]
Keeley, Alfred C., jr.
Keeley, Kate Orr.
Richey, Leo.[1]
Soderberg, Lillian.
Wenger, Arthur.
Wenger, Ray.
Wright, Naomi.[1]
Virginia:
McInturff, Oliver W.
Washington:
Classen, Arthur B.
Loveall, Mary E.
Mellis, William B.
Peterson, Elsie T.
Skoglund, John E.
Thompson, Frank H.
Willman, Kenneth.
West Virginia:
Watts, Lula.
Watts, Narcissa.
Wisconsin:
Conover, Dorothy.
Kallenbach, Maria.
Lind, Harry.[1]
Nueske, Arthur.[1]
Toombs, Flora.
Ontario:
Burk, Elsie.
Saskatchewan:
Stephenson, Rachel.
Wales:
Davies, William J.

IN THE KENDALL SCHOOL.

Alberta:
Roseuroll, Richelda.[1]
Delaware:
Ellingsworth, Ida.
Johnston, Florence.
Johnston, Robert.
Lynch, Edward.
McCabe, Ellen.
Peterson, Olivia.
Roberts, Pearl.
Sines, Mabel.
District of Columbia:
Ball, Annie.
Berman, Frank.
Boisseau, Sue Elizabeth.
Bostwick, Mabel
Cicchino, Antonio.
Cissell, William.
District of Columbia—Continued.
Covington, Alice.
Craven, Jack.
Dolan, James.
Dunn, Delma.
Goetz, Frances.
Hill, Frederick.
Hutchins, Elsie.
Looney, Thomas A.
Miller, John.
Miller, Mildred.
Minter, Leonidas.
Moore, Agnes.
Moore, Cecil.
Neitzey, Annie.
Norcia, Rosie.
O'Neil, Virgie.

[1] Admitted for school year 1915–16.

District of Columbia—Continued.
Pearson, Pearl.
Panholzer, Mary.
Pucci, Luiggi.
Reed, Florence.
Ridgeway, Francis.
Rowzee, Reuben.
Scott, Carlisle.
Sullivan, Charles.
Thompson, Philip.
Werdig, Robert.

Louisiana:
Tobey, Vasco.[1]

Manitoba:
Nicholson, Ethelwynne.[1]

Maryland:
Bowen, Clyde.

Nebraska:
Brant, Gerald.

New Jersey:
Dobbins, Charles.[1]

South Carolina:
Boatwright, Sophia.[1]

Tennessee:
Shawl, Arthur Lee.[1]

Texas:
Capa, Williams J.
Wheeler, Elma.

[1]Admitted for school year 1915–16.

APPENDIX C.

ADDRESS OF HON. FREDERICK L. SIDDONS, DELIVERED ON PRESENTATION DAY, MAY 5, 1915.

Mr. President and Candidates for the Degrees, Ladies and Gentlemen, When I received the invitation from your president to make a brief address this afternoon, I confess that I felt an unusual degree of pleasure at the invitation, a pleasure that is also a privilege, that I should this afternoon be afforded the opportunity of saying some few words of hope, and express some wishes for your success, you, the products of this great institution.

I do not believe that in the field of education, of educational development, has so much been accomplished as in that department which has undertaken the education of those who labor under some sort of physical disability. And in the last few days, as occasionally I have thought of this occasion, and what might appropriately be said, I have remembered with some amusement, but more shame, the attitude of judges, not so many generations ago, who refused to receive the testimony in court of a man or a woman who could neither hear nor speak. And these judges did so upon what seems to us to-day not only an absurd but barbarous notion that such persons were little short of imbeciles.

Think of it, ladies and gentlemen! Think of it as we are seated within this hall! Think of it as you reflect upon the three orations delivered before you this afternoon by three of the candidates, and you may then get some conception of the great strides that have been made in education. Who would suppose for a moment, as you read the list of degrees that it is to be hoped will shortly be conferred upon these young ladies and gentlemen, who would have supposed that they labor under any disability whatsoever? I venture to say that their addresses this afternoon, in thought, in form, in finish, quite equal those of the graduates from any of our universities or colleges.

It marks this work of education, marks a great step in the civilizing processes of our race. More and more we concern ourselves with the welfare, present and future, of those who at the outset of life perhaps would not, but for the assistance that society now gives, be equal to the contest of life before them. But happily that time has passed, and you, young ladies and gentlemen, may look forward with confidence to the future that is yours. You will take up your selected, your appointed work, and do it well, becoming as useful citizens as any of us may hope to be.

I notice that the motto of your class is a French phrase, "À outrance." Now, my French has become almost but a lingering memory. But this particular phrase, if I remember it, is susceptible of this interpretation, that "We are going the limit." [Laughter.]

You are going the limit in all that is worth while. You are going the limit in the work that you have selected to do. And as you enter upon that work, as you leave these halls, you will never cease to remember the obligation that you are under to the institution, to the faculty, to its founder, whose picture has been revealed to you this afternoon. And in that work will you not permit a modern justice to apologize to you for the mistakes of his remote predecessors, and to assure you that if it ever should be your obligation to appear before him you will not be rejected on the grounds formerly alleged.

I bid you Godspeed and success in the future of your work. [Applause.]

APPENDIX D.

REPORT OF THE PRESIDENT TO THE BOARD OF DIRECTORS.

To the Board of Directors of the Columbia Institution for the Deaf:

GENTLEMEN: Since taking charge of the Columbia Institution for the Deaf there has been no formal report made to the board, covering a period of more than a year's time. I think it may be proper, therefore, after the passage of five years, to lay before the board in a brief résumé some of the work that has been accomplished in that period, together with recommendations as to what might be done in the future.

BUSINESS ADMINISTRATION.

All the money of the institution is handled, as heretofore, under the direction of the president of the institution, who is president of the board, through a special disbursing agent of the United States Government. All expenses from United States funds are audited, as heretofore, by the secretary and treasurer of our board, and finally by the Auditor for the Interior Department. All other money received has been expended and accounted for in the same way, except that these accounts are, of course, audited only by the auditing committee of the board. All expenses, as heretofore, are reported quarterly to the board and annually to the Secretary of the Interior in the annual report of the institution.

Under the present system of buying all goods are purchased on written orders, duplicates of which are kept in the office, and no purchases are made except on the authority of the president or of the disbursing agent. All goods are checked off when they arrive, and bills are paid after the work of checking with duplicate orders is completed. Bids from at least three dealers are obtained, except on very small items or emergency orders, a storekeeper has been employed, a storeroom has been established, and all goods not perishable bought in large quantities at a decided saving.

A partial inventory of furniture and equipment has been made annually for two years, and a more complete one will be taken this year.

A new system of distributing expenses and comparing those of the present with those of previous years has been installed; also a careful account of food consumed at each kitchen; a separate account of the farm expenses, of expenses for repairs on the various buildings, and of expenses for District of Columbia pupils. The office work of the institution has been facilitated by the purchase of three additional typewriters and an adding machine.

A local switchboard with 22 branch telephones, property of the Chesapeake & Potomac Telephone Co., with practically all wiring below ground in lead-covered cable running through terra-cotta conduit (which had already been laid) has been installed. The central tower clock has been repaired and connected with the 12 old and 2 new subsidiary clocks and has been made to control them all successfully.

The annual appropriation for expenses attending instruction of deaf and dumb persons in this institution from the District of Columbia, under section 4864, Revised Statutes of the United States, and the act of March 1, 1901, has been raised from $10,000 to $12,250; appropriation for repairs from $5,000 to $6,000; appropriation for current expenses from $67,000 to $70,000; receipts from pay pupils from $4,000 to approximately $6,500; or a total increase of some $9,000. In addition, a special appropriation of $12,500 for improvement of the barns and the greenhouses, and the construction of a new dairy barn, and an appropriation of $21,000 for repairs and improvements to the heating and lighting system have been obtained. With the former appropriation the greenhouses were practically rebuilt and somewhat enlarged, and were brought nearer the central steam plant, to which they are now connected. The old carriage barn has been thoroughly repaired and provided with steam heat from the central power plant. No horses are now stabled in this building, but it is used for employees' quarters and for storage, as formerly. The carriage room is now used as a garage for our motor vehicles. One of these vehicles takes the place of the market wagon and the horse and buggy for the disbursing agent, and the other takes the place of the carriages and horses formerly maintained for the use of the president of the institution. The number of horses maintained has thus been reduced from seven to four—three for the farm and one for the grounds.

Payments to teachers, whose services really end with the close of the school year, are being gradually changed from 12 to 9 payments, so their salaries will end with the end of the fiscal year.

GENERAL ADMINISTRATION.

The management of the farm and the grounds has been separated and the former farmer and gardener placed in charge of the greenhouses and grounds. In this way it has been possible for him to give better attention to lawns and shrubbery. The farm and dairy have been placed under the charge of one of our college graduates, who is also a practical farmer, and the farmhouse and large farm barn have been greatly improved. Instruction in agriculture has been introduced for the young men of the college with success so far.

The management of the Kendall School has been separated, as far as possible, from that of the college. None of the teachers (with one exception) or officers on duty in the Kendall School have duties also in the college department. The boys of the Kendall School now have their own matron, with kitchen and dining room in their dormitory. This had also been arranged for the girls of the Kendall School. So we have adopted for the Kendall School the cottage system, which is now considered the best plan of organization for residential schools.

A regular night watchman has been employed, and fire drill practiced.

REPAIRS.

Many repairs and improvements have been carried out beside a few already referred to. The grounds have been resurveyed and a large part is now being inclosed with a new wire fence.

A modern, sanitary dairy barn with milk house was built four years ago. An additional silo was also erected. Over $3,000 have been expended in repairing the farmhouse and barn and in erecting four chicken houses and large cold frames. The old horse stable referred to above has been changed to a garage and storeroom with living quarters.

Eight new bathrooms in various buildings have been provided for the convenience of employees and five others have been rebuilt. Besides this, much plumbing has been torn out and replaced by modern work.

Seven hot-water heating plants have been installed, one in the Kendall School girls' cottage and six in the quarters of teachers or officers to replace worn-out hot-air furnaces.

A thorough revision of the main heating and lighting system is completed. New engines have been purchased and installed, the power plant repaired and brought up to date, a central hot-water heating plant established, all underground piping taken up and almost all of it renewed and placed in concrete conduits, the vacuum system installed, and the electrical wiring extended to Denison House and all the recitation rooms of both college and Kendall School. The main kitchen of the college has been thoroughly remodeled at an expense of over $2,500; three extra fire escapes have been built; houses Nos. 1 and 2 have been connected with the city sewerage system, instead of an old cesspool, at an expense of about $1,000; electric wiring has been installed in the president's house; houses Nos. 5 and 6, the farmhouse, and part of the gymnasium building have been pebble-dashed to preserve the woodwork. All outside woodwork of buildings has received from two to four coats of paint, and much interior paperhanging and painting has been done.

The chapel has been provided with new flooring and has been thoroughly redecorated. All of the main basement of this building has been given a new concrete floor and part of it a new metal ceiling.

The college boys' dormitory has been practically refitted with new furniture and the Kendall School dormitories supplied with new all-metal bedsteads. A large quantity of dishes, linen, etc., has been purchased for the use of the institution.

COURSE OF STUDY.

The course of study in the college had just been revised when I took charge. It has been added to by the introduction of instruction in agriculture, regular lessons in library cataloguing, business methods, and sewing. Our librarian, besides giving the theory of library cataloguing, has, with the aid of her pupils, finished a complete catalogue of our library according to the Dewey system.

In the Kendall School, the course of study has always been made to connect definitely with the college work. An increased number of pupils have graduated from the Kendall School and done successful work in the college in the last five years.

Manual training, including woodworking, rug weaving, basket making, drawing, cooking, and sewing, has been extended as far down the lower grades as possible.

REUNION OF ALUMNI.

A most enjoyable reunion of graduates and former students was held at the college, by invitation of the board of directors, from June 22–25, 1914. Over 200 were present. The success of our graduates in many lines of endeavor was noted. There were present teachers, farmers, ministers, chemists, architects, editors, and others representing many lines of endeavor.

The authorities of the college were urged by the alumni to extend higher technical work for the deaf.

ATTENDANCE.

Five years ago, the number of students and pupils in both departments of the institution, Gallaudet College and the Kendall School, was 120. The attendance now is over 150, an increase of some 30 per cent. As has been noted before, the increase in appropriations and income has been about $9,000, or a total of about 11 per cent. When the increase in attendance, the repairs completed, and also the continued increase in the price of foodstuffs, labor, materials, etc., which probably averages 10 per cent, are all considered, I feel that the expenses of the institution have been kept as low as could possibly be expected.

CHANGE IN THE NAME OF THE INSTITUTION.

The corporate name of the institution has been changed from the Columbia Institution for the Deaf and Dumb to the Columbia Institution for the Deaf. This is in line with the changes throughout the country, and is gratifying, as very few of the deaf are dumb, and only those who have not received instruction can not speak.

RECOMMENDATIONS.

REPAIRS AND IMPROVEMENTS.

There are a number of repairs and improvements which are needed to put the grounds and buildings of the institution in first-class condition. The most pressing of these is a new dormitory for the young women of the college, which has been requested for the last three years from Congress; but, so far, has not been provided for. An estimate for this important improvement has been presented again for the consideration of Congress this winter, and I hope will be favorably acted upon.

Owing to the considerable increase in attendance, some changes or additions to the college buildings will probably be necessary in the

near future. An addition to our laboratory, or a new recitation building providing six new recitation rooms and a museum, would enable the college boys' dormitory to be made available for a larger number of students by moving to the new addition or building the present six recitation rooms and the museum now in the college boys' building. The present museum could be then made into at least three comfortable rooms, and in all there would be nine new dormitory rooms for college men. Such added room for the young men and a new dormitory, providing for a larger number of women than the old building now used can accommodate, will probably take care of the growth in numbers in the college department for some time. This improvement would call for a special appropriation of about $20,000. In the Kendall School, while the dormitories are somewhat crowded, especially that used by the girls, there is not much likelihood of a great increase in numbers, and probably no necessity for much expense for the enlargement of these buildings.

In a number of our buildings there is still a considerable amount of old plumbing which should be replaced, and hundreds of square yards of old asphalt or concrete flooring in the basements which should be renewed or replaced by new concrete. It seems possible to take care of these two items of repair out of the regular appropriation allowed by Congress for special repairs and improvements. There are four or five items, however, in connection with the grounds of the institution, which need attention in the near future and which will probably call for special appropriations in order to take care of them properly.

From the Eighth Street entrance of the grounds on Florida Avenue to the farm buildings there is an old cinder road of about one-third of a mile in length, which should be rebuilt of macadam and used for all the heavy hauling to and from the institution. This would, no doubt, cause a considerable saving on the wear of the asphalt roadway from the main entrance near Seventh Street. The asphalt roadway now surrounding the campus and extending past several of the buildings should be widened at least half a yard on each side by using stone or concrete curbing with a brick or concrete gutter on the inside. This would give the room now required for larger vehicles, and would prevent the marring of the lawns by careless drivers—an almost daily occurrence under present conditions. A considerable length of old asphalt walks, especially those from Fowler Hall to the power house, from College Hall to the shop, and from the main driveway toward the president's office, should be taken up and cement walks substituted. Altogether these repairs and improvements to roadways would probably cost $4,000.

The eastern edge of the grounds, bordering on West Virginia Avenue, is now much below the present grade of that street, and an effort should be made to fill in this part of the grounds and bring it up to a proper and acceptable grade. It is probable that this work can be done without cost to the institution by making an arrangement with some large contracting firm in Washington to dump clean earth from excavations in this part of our grounds.

With the completion of the sewer work behind houses Nos. 1 and 2, all houses and buildings except the buildings at the farm are now connected by modern sewers to the city system. The farmhouse,

the barns, and the house occupied by the dairyman are now connected with a sewer which runs into an open trench at some distance from all of these buildings, leading down to a new sewer on West Virginia Avenue. There are some 700 feet of this open trench. A large sewer should be laid at this place (20 to 24 inches) and the trench filled in. There would then be no opportunity for criticism of our drainage system.

As time goes by and the neighborhood is built up more thickly it becomes increasingly difficult to protect our grounds properly. It seems probable that a wise move in the future will be to fence our grounds with a high, substantial fence. This project will be a very expensive one, as the total distance around our grounds is nearly 2 miles.

COURSES OF STUDY.

Agriculture has been recognized as one of the best fields for deaf people to enter at the present time. We have, therefore, made Mr. Harley D. Drake, our farmer, a regular instructor in agriculture in the college. His teaching work should be extended. As mentioned in another part of this report, we have arranged for work in sewing in the college department, and I believe that cooking should be added to the curriculum also.

For both the young men and the young women of the college, it would seem wise to provide instruction in drawing and designing of a much more extended nature than that given at present. This would probably call for a regular instructor on full time and considerable expense, but should open to the students of the college a new field of endeavor.

Another line of practical instruction which would seem to be worthy of great consideration in the near future is that of linotype operation. A number of the schools for the deaf have installed linotype machines and have provided instructors, but in none of them has it been possible, on account of the limited time and of the youth of the pupils, to turn out finished operators without post-graduate work. It has been suggested by a number of our graduates that a linotype be purchased for our college, and that an instructor in the operation and repair of this machine be employed. The college students' periodical and possibly other work could be turned out on such a machine, and regular instruction given to a limited number of students who have already made some progress in printing before coming to college. This would call for an outlay of $4,000 for the plant, and about $1,500 annually for instruction, supplies, etc.

METHODS OF INSTRUCTION EMPLOYED.

Throughout the United States there has been an increase in the use of speech for the instruction of deaf pupils, and also an increase in the number taught to use speech to a limited extent, although not taught entirely by means of speech. This movement received great impetus, if it was not actually begun, by the report of Dr. E. M. Gallaudet some 50 years ago after his visit to European schools, when he urged that all deaf children be given ample opportunity to learn to speak and to preserve their speech.

In our Kendall School at present practically all of the beginners are taught by speech, and the school work of all the pupils is done in this way as long as it seems practicable. In the college department a large amount of oral work and speech work is done, but the problem is much harder because of the fact that the students come from many schools employing various methods and because there are always some students who have never had any oral instruction worth while. Outside of classrooms, in social gatherings, lectures, and religious exercises manual methods are freely used.

The general policy of our institution is freedom of methods of instruction, making use of speech, the manual alphabet, and signs, as deemed best for the mental advancement of the student. Many pitiful cases of retarded mental development, caused by the use of narrow methods by teachers of the deaf, have come under the observation of American educators from time to time.

The educated deaf of the world are strongly in favor of the use of all methods of instruction for the benefit of the mental development of the pupil. It would seem wisest, therefore, from the point of view of experience and sound pedagogy and psychology, to make the method fit the student rather than fit the student to the method. Therefore the combined system of instruction has been and should be continued in use in our institution.

Respectfully submitted to the board.

PERCIVAL HALL,
President.

APPENDIX E.

REGULATIONS.

I. The academic year is divided into three terms, the first beginning on the last Thursday in September and closing on the 24th of December; the second beginning the 29th of December and closing the next to the last Friday in March; the third beginning the following Monday and closing the Wednesday before the last Wednesday in June.

II. The vacation is from the Wednesday before the last Wednesday in June to the last Thursday in September.

III. There are holidays at Thanksgiving, Christmas, Washington's Birthday, Easter, and Decoration Day.

IV. Pupils may visit their homes during the regular vacation and on the above-named holidays, but at no other time unless for some special urgent reason, and then only by permission of the president.

V. The bills for the maintenance and tuition of pupils supported by their friends must be paid semiannually in advance.

VI. The charge for pay pupils is $350 per annum. This sum covers all expenses in the primary department except clothing and extraordinary medical attention, and all in the college except clothing, books, and extraordinary medical attendance.

VII. All deaf-mutes of teachable age, of good mental capacity, and properly belonging to the District of Columbia are received without charge. To students from the States and Territories who have not the means of defraying all the expenses of the college course the board of directors renders such assistance as circumstances seem to require, so far as the means at its disposal will allow.

VIII. It is expected that the friends of the pupils will provide them with clothing, and it is important that upon entering or returning to the institution they should be supplied with a sufficient amount for an entire year. All clothing should be plainly marked with the owner's name.

IX. All letters concerning pupils or applications for admission should be addressed to the president.

X. The institution is open to visitors during term time on Thursdays only, between the hours of 9 a. m. and 3 p. m. Visitors are admitted to chapel service on Sunday afternoons at 5 o'clock.

REPORT OF THE FREEDMEN'S HOSPITAL.

REPORT OF THE FREEDMEN'S HOSPITAL.

STAFF.

W. A. Warfield, M. D., *Surgeon in Chief.*
S. L. Carson, M. D., *Assistant Surgeon.*
C. A. Brooks, M. D., *Resident Physician.*
Walter Van Swearingen, M. D., *Pathologist.*
T. E. Jones, M. D., *Anæsthetist.*

NURSES.

Laura R. MacHale, Registered Nurse, New Jersey, *Superintendent.*
Emma M. Irwin, Registered Nurse, Illinois, *Assistant Superintendent.*
Martha E. Cabaniss, Registered Nurse, Virginia, *Night Supervisor.*
Mary S. Booth, Head Nurse.
Cecelia M. Green, Head Nurse.
Bertha J. Thomas, Head Nurse.

CLERK AND ASSISTANTS.

F. D. Henry, U. S. Garnes, W. E. Cobb.

INTERNES.

F. F. Durrah, M. D.
R. P. McClain, M. D.
H. J. Oliver, M. D.
E. Y. Strawn, M. D.
G. W. White, M. D.
L. G. Brown, M. D.
A. M. Curtis, jr., M. D.
F. A. Gordon, M. D.
J. M. Vaughan, M. D.
R. H. Young, M. D.

William E. Davis, *Pharmacist.*
B. H. Hunton, *Assistant Pharmacist.*

ADVISORY VISITING STAFF.

Edward A. Balloch, M. D.
Edward D. Williston, M. D.
J. E. H. Taylor, M. D.
Wm. F. Sowers, M. D.
Wm. A. Jack, M. D.
Jas. J. Richardson, M. D.
J. B. Nichols, M. D.

VISITING STAFF.

INDOOR.

Medical.

Henry P. Parker, M. D.
Caryl Burbank, M. D.
Thomas Martin, M. D.
E. S. Hendry, M. D.
Robert W. Brown, M. D.
J. B. Nichols, M. D.
E. H. Reede, M. D.
Lewis Ecker, M. D.

Surgical.

E. A. Balloch, M. D.
Wm. F. Sowers, M. D.
Wm. A. Jack, M. D.
H. H. Kerr, M. D.
A. M. Curtis, M. D.

Gynecological.

W. A. Warfield, M. D.
Wm. C. McNeill, M. D.
Howard Hume, M. D.
J. E. H. Taylor, M. D.
H. W. Lawson, M. D.

Assistants: S. L. Cook, M. D.; H. R. Burwell, M. D.; J. W. Ross, M. D.

Obstetrical.

Edward D. Williston, M. D.
N. D. Graham, M. D.
H. W. Freeman, M. D.
Geo. N. Perry, M. D.

Ophthalmological.

Robert S. Lamb, M. D. Assistants: Martha B. Lyon, M. D.; Elizabeth Sohon, M. D.

Otology and Rhinology.

Jas. J. Richardson, M. D. Assistant: Hamilton S. Martin, M. D.

Neurology.

Tom A. Williams, M. D. Assistants: E. C. A. Wilson, M. D.; E. G. Mitchell, M. D.; Harry A. Bishop, M. D.

Genito-Urinary.

H. A. Fowler, M. D. Assistants: Milton A. Francis, M. D.; R. Arthur Hooe, M. D.

Orthopedics.

Wm. G. Erving, M. D.; John Dunlop, M. D.; Chas. A. Allen, M. D.

Pediatrics.

John W. Mitchell, M. D.; Wm. J. French, M. D.; Milton Hahn, M. D.

OUTDOOR.

Medical.

E. H. Reede, M. D.
U. J. Daniels, M. D.
C. A. Tignor, M. D.
A. L. Curtis, M. D.
S. S. Thompson, M. D.
Lee A. Gill, M. D.
B. G. M. Robinson, M. D.
Chas. A. Allen, M. D.
F. D. Whitby, M. D.

Minor Surgery.

Wm. A. Jack, M. D.; C. W. Childs, M. D.; A. L. Curtis, M. D.

Ophthalmological.

R. S. Lamb, M. D. Assistants: Martha B. Lyon, M. D.; James C. Dowling, M. D.; Elizabeth Sohon, M. D.; E. C. A. Wilson, M. D.

Otology and Rhinology.

Jas. J. Richardson, M. D. Assistant: Hamilton S. Martin, M. D.

Neurology.

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Gynecology.

Wm. C. McNeill, M. D. Assistants: Chas. H. Marshall, M. D.; H. R. Burwell, M. D.; S. Le Count Cook, M. D.

Orthopedics.

Wm. G. Erving, M. D.; John Dunlop, M. D. Assistant: Chas. A. Allen, M. D.

Pediatrics.

John W. Mitchell, M. D.; Milton Hahn, M. D. Assistant: Marie B. Lucas, M. D.

Dermatology.

H. R. Burwell, M. D.
H. H. Hazen, M. D.
Wm. F. Hemler, M. D.
Katie B. Boyle, M. D.

Tuberculosis.

James T. Blue, M. D.

INTRODUCTION.

WASHINGTON, D. C., *August 5, 1915.*

SIR: I have the honor to submit for your consideration the annual report of the Freedmen's Hospital for the fiscal year ended June 30, 1915:

A large increase in the volume of work, as compared with the preceding year, is noted, and the results have more than justified the efforts put forth to keep the hospital abreast of the times and in the highest state of efficiency possible with the means provided for its support.

More patients were treated in the hospital than during any previous year of its history and more were refused admission, in order that the appropriations made by Congress for its operation would not be exceeded.

PATIENTS.

At the close of the last fiscal year there were 187 patients remaining in the hospital. During the year covered by this report 3,348, including births, were admitted, making a total of 3,535 indoor patients receiving care and treatment, as against 3,335 the preceding year. Of the number admitted, including births, 285 were pay patients and 3,063 were indigent. One thousand three hundred and eighty-nine of the latter number were residents of the States and 1,674 were from the District of Columbia. A total of 307 births occurred in the hospital; 28 were pay and 279 were indigents.

During the year 3,354 were discharged, including births. Of this number 276 were pay patients and 3,078 were indigent. Two hundred and fifty-six deaths occurred from all causes, as against 276 last year. This is not regarded as a very high death rate when it is remembered that a large number of patients come from homes surrounded by the worst sanitary conditions, half fed, improperly clothed, seeking hospital treatment as the last resort. The wonder is that the mortality is not even greater.

At the close of the year there were 181 patients remaining; 15 were pay, 102 United States indigents, and 64 District of Columbia indigents.

There were 2,296 surgical operations performed, representing an increase of 35 per cent over last year, with a mortality of 2.1 per cent. This is a remarkably low death rate notwithstanding the desperate conditions in which many surgical cases are found at the time of entrance into the hospital.

In the dispensary or out-patient department 5,874 were treated, as follows: Medical, 1,781; minor surgical, 274; gynecological, 416; neurological, 142; eye, 923; ear, nose, and throat, 811; genito-urinary

482; pediatrics, 402; dermatological, 417; orthopedic, 150; and tuberculosis, 70. There were 15,185 revisits made by the patients while undergoing treatment in the several clinics of this service, and 2,609 surgical dressings were necessary. It is observed that much of the difficulty heretofore experienced in getting patients to revisit the dispensary at stated intervals for continued treatment is gradually disappearing. In a large measure this is doubtlessly due to the increasing confidence in hospital treatment by this class of patients as well as to the benefits derived therefrom.

Patients admitted each year for the past 41 years.

Year ending June 30—		Year ending June 30—		Year ending June 30—	
1875	190	1889	2,074	1903	2,677
1876	319	1890	2,392	1904	2,907
1877	500	1891	2,373	1905	2,918
1878	519	1892	2,331	1906	2,207
1879	642	1893	2,422	1907	2,366
1880	819	1894	2,801	1908	2,669
1881	892	1895	2,476	1909	2,590
1882	1,102	1896	2,596	1910	2,740
1883	1,373	1897	2,815	1911	2,900
1884	1,509	1898	2,355	1912	3,385
1885	1,794	1899	2,374	1913	3,208
1886	1,923	1900	2,427	1914	3,144
1887	2,017	1901	2,414	1915	3,348
1888	1,997	1902	2,408		

Statistical Tables.

INDOOR SERVICE.

The following tables set forth in classified detail the medical and surgical diseases, admissions, discharges, and results of the indigent indoor patients:

Medical and surgical diseases, except pay patients.

Disease.	Remaining July 1, 1914.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1915.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Dead.	Total.			
Abscesses, infections, ulcers.															
Abscess:															
Breast	1	....	....	.....	1	2	.....	2	....	....	....	2	13	6.5	....
Carotid	....	....	....	.....	1	1	.....	1	....	....	....	1	26	13	....
Ear	....	1	....	.....	.....	1	.....	1	....	....	....	1	8	8	....
Elbow	....	....	....	1	.....	1	.....	1	....	....	....	1	5	5	....
Foot	....	....	....	1	.....	1	.....	1	....	....	....	1	3	3	....
Ischiorectal	1	....	....	9	6	16	2	10	3	....	....	15	245	16.3	1
Jaw	1	....	....	1	.....	2	1	1	....	....	....	2	24	12	....
Lung	1	....	....	1	.....	2	.....	1	1	....	....	2	224	112	....
Nose	....	....	....	1	.....	1	.....	1	....	....	....	1	35	35	....
Peritonsillar	....	....	....	1	1	2	1	1	....	....	....	2	24	12	....
Periurethral	....	....	....	3	.....	3	2	1	....	....	....	3	59	19.6	....
Pyonoidal	....	....	....	.....	1	1	.....	1	....	....	....	1	37	37	....
Sternum	....	1	....	2	.....	3	.....	3	....	....	....	3	87	29	....
Thigh	....	....	....	1	.....	1	.....	1	....	....	....	1	17	17	....
Vulvo-vaginal	....	....	....	.....	4	....	.....	2	....	....	....	4	47	11.7	....

Medical and surgical diseases, except pay patients—Continued.

Disease.	Remaining July 1, 1914.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1915.
		White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Not treated.	Dead.	Total.			
		Male.	Female.	Male.	Female.										
Abscesses, infections, ulcers—Continued.															
Infections:															
Abdominal wall	.....	.....	.....	.....	1	1	.....	1	.....	.....	.....	1	35	35	.....
Arm	.....	.....	.....	2	.....	2	.....	2	.....	.....	.....	2	36	18	.....
Breast	1	.....	.....	.....	.....	1	1	.....	.....	.....	.....	1	76	76	.....
Bursa	.....	.....	.....	1	1	2	.....	2	.....	.....	.....	2	28	14	.....
Face	.....	.....	.....	1	.....	1	.....	.....	.....	.....	1	1	1	1	.....
Frontal sinus	.....	.....	.....	2	.....	2	1	.....	.....	.....	1	2	23	11.5	.....
Hand	1	.....	.....	4	3	8	2	5	.....	.....	.....	7	141	20	1
Knee	.....	.....	.....	1	.....	1	1	.....	.....	.....	.....	1	119	119	.....
Leg	.....	1	.....	.....	1	2	.....	2	.....	.....	.....	2	101	50.5	.....
Neck	.....	.....	.....	3	2	5	3	2	.....	.....	.....	5	77	15.4	.....
Scrotum	.....	.....	.....	1	.....	1	1	.....	.....	.....	.....	1	20	20	.....
Toe	.....	.....	.....	1	5	6	2	4	.....	.....	.....	6	75	12.5	.....
Tooth	.....	.....	.....	1	.....	1	.....	1	.....	.....	.....	1	3	3	.....
Umbilical cord	.....	.....	.....	.....	1	1	1	.....	.....	.....	.....	1	12	12	.....
Vein	1	.....	.....	2	.....	3	1	2	.....	.....	.....	3	67	22.3	.....
Ulcers:															
Foot	2	.....	.....	1	.....	3	.....	2	.....	.....	.....	2	30	15	1
Leg	2	.....	.....	6	14	22	3	14	2	.....	.....	19	125	6.6	3
Stomach	3	.....	.....	.....	10	13	4	3	4	.....	1	12	388	32.3	1
Bones and joints.															
Ankylosis:															
Ankle	.....	.....	.....	.....	1	1	.....	1	.....	.....	.....	1	60	60	.....
Hip	1	.....	.....	2	1	4	.....	4	.....	.....	.....	4	410	102	.....
Elbow	.....	.....	.....	3	2	5	.....	3	1	.....	.....	4	104	26	1
Knee	.....	.....	.....	.....	2	2	.....	2	.....	.....	.....	2	177	88.5	.....
Wrist	.....	.....	.....	.....	1	1	.....	1	.....	.....	.....	1	20	20	.....
Arthritis:															
Gonorrheal	1	.....	.....	12	4	17	1	14	1	.....	.....	16	409	25.5	1
Infectious	3	.....	.....	8	17	28	4	21	2	.....	.....	27	1,115	41	1
Traumatic	1	.....	.....	1	2	4	2	1	1	.....	.....	4	88	22	.....
Tubercular—															
Elbow	.....	.....	.....	.....	1	1	.....	1	.....	.....	.....	1	24	24	
Hip	.....	.....	.....	2	3	5	.....	2	.....	.....	1	3	129	43	2
Knee	5	.....	.....	1	1	7	.....	7	.....	.....	.....	7	1,067	152.4	.....
Spine	1	.....	.....	9	1	11	.....	6	4	.....	.....	10	252	25.2	1
Deformities:															
Fallen arches	.....	.....	.....	1	3	4	.....	3	1	.....	.....	4	22	5.5	.....
Genu valgus	.....	.....	.....	1	4	5	1	2	1	.....	.....	4	85	21.5	1
Genu varum	3	.....	.....	.....	.....	3	2	1	.....	.....	.....	3	233	77	.....
Scoliosis	.....	.....	.....	.....	2	2	.....	2	.....	.....	.....	2	31	15.5	.....
Talipes equino varus	1	.....	.....	.....	.....	1	.....	1	.....	.....	.....	1	64	64	.....
Dislocations:															
Humerus	.....	.....	.....	1	.....	1	.....	1	.....	.....	.....	1	4	4	.....
Knee	.....	.....	.....	1	.....	1	.....	1	.....	.....	.....	1	20	20	.....
Radius, head	.....	.....	.....	.....	1	1	.....	1	.....	.....	.....	1	21	21	.....
Fracture															
Femur	3	.....	.....	6	3	12	3	6	1	.....	1	11	508	46	1
Fibula	.....	.....	.....	4	2	6	2	3	1	.....	.....	6	116	19.3	.....
Humerus	.....	1	.....	3	1	5	.....	5	.....	.....	.....	5	98	19.6	.....
Metacarpal	.....	.....	.....	2	1	3	1	2	.....	.....	.....	3	31	10.3	.....
Metatarsal	.....	.....	.....	2	.....	2	.....	1	.....	.....	.....	1	5	5	1
Nasal bone	.....	.....	.....	.....	1	1	.....	1	.....	.....	.....	1	7	7	.....
Pelvis	.....	1	.....	1	.....	2	1	1	.....	.....	.....	2	72	36	.....
Patella	.....	1	.....	1	.....	2	1	.....	.....	.....	.....	1	58	58	1
Radius	2	.....	.....	5	3	10	1	7	.....	.....	1	9	143	15.9	1
Rib	.....	.....	1	2	2	5	1	2	.....	.....	.....	3	32	10.6	2
Skull	.....	2	.....	2	1	5	.....	4	.....	.....	1	5	103	20.6	.....
Tibia	.....	.....	.....	5	6	11	3	5	.....	.....	.....	8	206	25.8	3
Tibia and fibula	.....	1	.....	2	.....	3	.....	3	.....	.....	.....	3	129	43	.....
Vertebræ	.....	.....	.....	1	.....	1	.....	.....	.....	.....	1	1	15	15	.....
Osteomyelitis:															
Inferior maxilla	.....	.....	.....	2	2	4	.....	4	.....	.....	.....	4	34	8.7	.....
Tibia	.....	.....	.....	8	4	12	.....	10	.....	.....	.....	10	717	71.7	2
Periostitis, tibia	.....	.....	.....	.....	3	3	.....	2	.....	.....	.....	2	25	12.5	1

Medical and surgical diseases, except pay patients—Continued.

Disease.	Remaining July 1, 1914.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining Ju 1, 1915.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Dead.	Total.			
Bones and joints—Con.															
Sprain:															
Ankle	....	....	....	4	1	5	.....	5	....	....	....	5	96	19.2	....
Hip	....	....	....	.....	2	2	1	1	....	....	....	2	5	2.5	....
Knee	....	....	....	1	1	2	.....	1	....	....	....	1	9	9	1
Sacro-iliac	1	....	....	9	2	12	.....	10	....	....	....	10	363	36.3	2
Shoulder	....	....	....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Synovitis	1	....	....	7	5	13	2	11	....	....	....	13	382	29	....
Circulatory system.															
Aneurysm:															
Aorta	....	....	....	4	3	7	.....	6	1	....	....	7	291	43	....
Common carotid	....	....	....	.....	1	1	.....	1	....	....	....	1	102	102	....
Common iliac	....	....	....	.....	1	1	.....	1	....	....	....	1	91	91	....
Sciatic	....	....	....	1	.....	1	1	.....	....	....	....	1	42	42	....
Angina pectoris	....	....	....	.....	3	3	.....	3	....	....	....	3	12	4	....
Cerebral hemorrhage	6	....	....	9	4	19	1	5	2	....	9	17	1,461	85.9	2
Gangrene foot	1	....	....	4	.....	5	3	1	....	....	1	5	389	77.8	....
Hemorrhoids	2	....	....	20	3	25	13	7	3	....	....	23	319	13.9	2
Intestinal hemorrhage	....	....	....	.....	1	1	.....	.....	.....	.....	1	1	9	9	....
Post operative hemorrhage	....	....	....	2	.....	2	.....	2	....	....	....	2	18	9	....
Sclerosis	....	....	....	2	8	10	2	7	1	....	....	10	197	19.7	....
Stokes Adam disease	....	....	....	1	.....	1	.....	1	....	....	....	1	57	57	....
Umbilical hemorrhage	....	....	....	1	.....	1	.....	.....	.....	.....	1	1	1	1	....
Valvular disease:															
Insufficiency—															
Aortic	2	....	....	19	6	27	.....	20	1	....	4	25	1,357	54	2
Mitral	1	1	1	33	14	50	.....	32	3	....	12	47	943	20	3
Stenosis—															
Aortic	....	....	....	1	.....	1	.....	.....	1	....	....	1	9	9	....
Mitral	....	....	....	1	1	2	.....	2	....	....	....	2	110	55	....
Varicose veins	2	....	....	2	4	8	2	6	....	....	....	8	270	33.7	....
Constitutional diseases.															
Anemia	....	....	....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Diabetes mellitus	....	....	....	1	3	4	.....	2	....	....	2	4	217	54.2	....
Leukemia	....	....	....	1	.....	1	.....	1	....	....	....	1	19	19	....
Marasmus	....	....	....	9	6	15	3	5	1	....	4	13	255	19.5	2
Rickets	1	....	....	4	.....	5	2	1	....	....	2	5	217	43.4	....
Digestive system.															
Appendicitis:															
Acute	2	....	....	18	17	37	18	10	....	....	7	35	925	26.4	2
Chronic	6	....	....	8	13	27	18	4	3	....	2	27	766	28	....
Constipation	....	....	....	4	6	10	2	8	....	....	....	10	98	9.8	....
Enteritis	1	....	....	29	20	50	9	15	4	....	21	49	691	14	1
Enteroptosis	....	....	....	.....	2	2	.....	1	1	....	....	2	32	16	....
Fistulo in ano	2	....	....	5	7	14	8	5	....	....	1	14	508	36	....
Fissure in ano	....	....	....	4	3	7	4	3	....	....	....	7	208	29.7	....
Hernia:															
Epigastric	....	....	....	1	.....	1	.....	.....	.....	.....	1	1	6	6	....
Femoral	....	....	....	.....	1	1	1	.....	....	....	....	1	13	13	....
Incisional	....	....	....	.....	4	4	3	1	....	....	....	4	99	24.7	....
Inguinal	2	1	....	65	10	78	60	7	4	....	2	73	1,847	25	5
Umbilical	....	....	....	3	3	6	4	.....	.....	....	1	5	143	28.6	1
Intestinal obstruction	1	....	....	6	2	9	2	2	.....	....	5	9	284	31.5	....
Liver:															
Cholelithiasis	....	....	....	2	8	10	4	3	1	....	2	10	200	20	....
Cholecystitis	1	....	....	4	2	7	3	2	1	....	1	7	150	21.4	....
Cirrhosis	....	....	....	2	.....	2	.....	.....	1	....	1	2	21	10.5	....
Pancreatitis	....	....	....	1	1	2	.....	1	1	....	....	2	61	30.5	....
Stomach:															
Carcinoma	....	....	....	3	3	6	.....	2	2	....	2	6	150	25	....
Gastritis—															
Acute	....	1	....	10	15	26	6	15	2	....	....	23	145	6.2	3
Chronic	....	....	....	7	4	11	1	9	1	....	....	11	186	16.9	....
Neurosis	....	....	....	2	.....	2	.....	.....	1	....	....	1	4	4	1
Pylorospasm	1	....	....	.....	.....	1	.....	1	....	....	....	1	40	40	....

Medical and surgical diseases, except pay patients—Continued.

Disease.	Remaining July 1, 1914.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1915.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Dead.	Total.			
Digestive system—Con.															
Stomatitis	.....	.....	.....	.....	1	1	.....	1	.....	.....	.....	1	17	17	....
Stricture esophagus	.....	.....	.....	1	.....	1	.....	1	.....	.....	.....	1	36	36	....
Stricture rectum	1	.....	.....	2	4	7	3	3	1	.....	.....	7	202	28.8	....
Eye, ear, nose, and throat.															
Eye:															
Cataract	3	1	.....	13	5	22	6	9	5	.....	.....	20	1,221	61	2
Chalazion	.....	.....	.....	.....	1	1	.....	1	.....	.....	.....	1	1	1	....
Conjunctivitis	3	.....	.....	2	3	8	3	3	.....	.....	.....	6	409	68.1	2
Corneal ulcer	.....	.....	.....	4	4	8	1	4	1	.....	.....	6	150	25	2
Choroiditis	1	.....	.....	2	.....	3	.....	3	.....	.....	.....	3	22	7.3	....
Glaucoma	.....	.....	.....	3	1	4	.....	4	.....	.....	.....	4	109	27.2	....
Iridocyclitis	.....	.....	.....	1	.....	1	.....	1	.....	.....	.....	1	44	44	....
Iritis	3	.....	.....	7	7	17	.....	14	2	.....	.....	16	878	54.9	1
Keratitis	.....	.....	.....	4	1	5	.....	4	.....	.....	.....	4	81	20.2	1
Ophthalmia neonatorum	.....	.....	.....	1	1	2	1	1	.....	.....	.....	2	51	25.5	....
Optic atrophy	1	.....	.....	2	4	7	1	3	.....	.....	.....	4	95	23.9	3
Panophthalmitis	.....	.....	.....	1	.....	1	1	.....	.....	.....	.....	1	6	6	....
Pterygium	.....	.....	.....	1	.....	1	1	.....	.....	.....	.....	1	10	10	....
Strabismus	.....	.....	.....	1	1	2	.....	2	.....	.....	.....	2	34	17	....
Traumatic ptosis	.....	.....	.....	1	.....	1	.....	.....	1	.....	.....	1	4	4	....
Ear:															
Mastoiditis	1	.....	.....	4	1	6	1	2	.....	.....	2	5	109	21.8	1
Otitis media	.....	.....	.....	1	1	2	.....	2	.....	.....	.....	2	50	25	....
Nose:															
Dachryocystitis	.....	.....	.....	.....	1	1	.....	1	.....	.....	.....	1	46	46	....
Deflected septum	.....	.....	.....	.....	1	1	1	.....	.....	.....	.....	1	9	9	....
Hypertrophied turbinate	.....	.....	.....	1	.....	1	.....	1	.....	.....	.....	1	3	3	....
Rhinitis, acute	.....	.....	.....	2	3	5	3	2	.....	.....	.....	5	92	18.4	....
Throat: Adenoids	.....	.....	.....	2	1	3	2	1	.....	.....	.....	3	12	4	....
Tonsillitis:															
Acute	.....	.....	.....	13	17	30	16	13	1	.....	.....	30	291	9.7	....
Chronic	.....	.....	.....	50	36	86	53	30	1	.....	.....	84	399	4.7	2
Genitourinary.															
Chancroid	1	.....	.....	8	6	15	3	11	.....	.....	.....	14	475	33.9	1
Cystitis	.....	.....	.....	7	2	9	.....	6	1	.....	.....	7	199	28	2
Epididymitis	.....	.....	.....	13	.....	13	4	8	.....	.....	1	13	235	18	....
Fistula, perineal	.....	.....	.....	3	.....	3	.....	2	1	.....	.....	3	65	21.8	....
Gonorrhoea	.....	1	1	19	5	26	5	17	2	.....	.....	24	350	14.5	2
Hydrocele	.....	.....	.....	3	.....	3	2	1	.....	.....	.....	3	79	29.5	....
Kidney:															
Acute parenchymatous nephritis	.....	1	.....	4	4	9	1	6	.....	.....	2	9	143	15.9	....
Chronic interstitial nephritis	7	.....	.....	41	19	67	5	32	3	.....	26	66	2,333	35.3	1
Pyonephrosis	.....	1	.....	2	3	6	.....	4	1	.....	.....	5	41	8.2	1
Renal calculus	.....	.....	.....	2	1	3	1	1	1	.....	.....	3	37	12.3	....
Renal colic	.....	.....	.....	1	.....	1	1	.....	.....	.....	.....	1	44	44	....
Tuberculosis kidney	2	.....	.....	2	.....	4	1	2	1	.....	.....	4	471	117.7	....
Oedema scrotum	.....	.....	.....	3	.....	3	1	2	.....	.....	.....	3	100	33.3	....
Orchitis:															
Syphilitic	.....	.....	.....	3	.....	3	1	2	.....	.....	.....	3	102	34	....
Tubercular	.....	.....	.....	3	.....	3	.....	1	1	.....	1	3	62	20.6	....
Phimosis	.....	.....	.....	34	.....	34	19	12	3	.....	.....	34	387	11.3	....
Prostatitis	1	.....	.....	13	.....	14	1	11	1	.....	1	14	477	34	....
Retention urine	.....	.....	.....	3	1	4	1	3	.....	.....	.....	4	41	10.2	....
Undescended testicle	.....	.....	.....	3	.....	3	2	1	.....	.....	.....	3	85	28.3	....
Urethral calculus	.....	.....	.....	1	1	2	.....	1	1	.....	.....	2	73	36.5	....
Urethral stricture	1	.....	.....	20	.....	21	4	15	.....	.....	2	21	349	16.5	....
Varicocele	.....	.....	.....	1	.....	1	1	.....	.....	.....	.....	1	21	21	....
Vesical calculus	.....	.....	.....	.....	2	2	2	.....	.....	.....	.....	2	92	46	....

Medical and surgical diseases, except pay patients—Continued.

Disease.	Remaining July 1, 1914.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1915.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Dead.	Total.			
Gynecological.															
Abdominal fistula	.....	....	...	.....	1	1	.....	1	....	....	....	1	45	45	....
Abortion	2	....	...	.....	38	40	29	9	1	....	....	39	417	10.7	1
Abortion, threatened	1	....	...	.....	3	4	1	1	2	....	....	4	29	7.2	....
Anteflexion uterus	.....	....	...	.....	4	4	2	.....	2	....	....	4	46	11.5	....
Carcinoma cervix	.....	....	...	.....	16	16	.....	8	4	....	4	16	229	14.2	....
Ectopic gestation	.....	....	...	.....	10	10	5	4	....	....	1	10	238	23.8	....
Endometritis	.....	....	...	.....	16	16	7	5	2	....	....	14	226	16	2
Fibroma uteri	5	....	...	.....	106	111	77	20	6	....	4	107	2,695	25	4
Fistula, vesico-vaginal	1	....	...	.....	1	2	1	1	....	....	....	2	77	38.5	....
Hypertrophy cervix	.....	....	...	.....	2	2	1	1	....	....	....	2	48	24	....
Intraligamentous cyst	.....	....	...	.....	1	1	1	.....	....	....	....	1	31	31	....
Lacerated cervix	.....	....	...	.....	2	2	.....	1	1	....	....	2	19	9.5	....
Lacerated perineum	1	....	...	.....	11	12	8	2	1	....	....	11	287	26	1
Menopause	.....	....	...	.....	1	1	.....	.....	1	....	....	1	69	69	....
Menorrhagia	.....	....	...	.....	9	9	2	6	1	....	....	9	63	7	....
Metritis	1	....	...	.....	3	4	2	2	....	....	....	4	107	26.7	....
Ovary:															
Cystic ovary	1	....	1	.....	39	41	22	9	3	....	1	35	762	21.7	6
Dermoid cyst	.....	....	...	.....	1	1	1	.....	.....	....	....	1	20	20	....
Ovarian cyst	.....	....	...	.....	2	2	2	.....	.....	....	....	2	57	28.5	....
Post operative adhesions	.....	....	...	.....	9	9	3	2	2	....	....	7	136	19.4	2
Procidentia	.....	....	...	.....	4	4	1	.....	1	....	....	2	34	17	2
Pruritis vulvæ	.....	....	2	.....	.....	2	.....	2	.....	....	....	2	85	42.5	....
Pyosalpingitis	7	....	...	.....	48	55	40	9	3	....	1	53	1,648	31	2
Retroflexed uterus	.....	....	...	.....	2	2	2	.....	.....	....	....	2	42	21	....
Retroverted uterus	1	....	...	.....	9	10	7	.....	2	....	....	9	206	22.9	1
Ruptured uterus	.....	....	...	.....	1	1	1	.....	.....	....	....	1	25	25	....
Salpingitis	3	....	...	.....	107	110	60	24	8	....	....	92	2,011	21.9	18
Stenosis cervix	.....	....	...	.....	1	1	1	.....	.....	....	....	1	11	11	....
Vaginitis	.....	....	...	.....	1	1	.....	1	.....	....	....	1	8	8	....
Infectious diseases.															
Bronchopneumonia	.....	....	...	11	6	17	7	1	....	....	9	17	296	17.3	....
Cerebrospinal meningitis	.....	....	...	2	2	4	.....	.....	.....	....	4	4	19	4.7	....
Erysipelas	.....	....	...	2	1	3	.....	1	....	....	2	3	27	9	....
Influenza	.....	....	...	5	3	8	5	3	....	....	....	8	63	7.8	....
Malaria	.....	1	...	9	6	16	7	8	1	....	....	16	241	15	....
Pellagra	1	....	...	.....	4	5	.....	1	....	....	4	5	137	27.4	....
Pneumonia, lobar	.....	1	...	37	13	51	22	15	....	....	14	51	904	17.7	....
Rheumatism	3	1	...	10	15	29	4	19	....	....	2	25	508	20.3	4
Syphilis:															
Cerebral	1	....	...	4	1	6	.....	3	3	....	....	6	141	23.5	....
Congenital	.....	....	...	2	1	3	.....	1	....	....	2	3	98	32.6	....
Primary	1	....	1	2	1	5	.....	5	....	....	....	5	93	18.6	....
Secondary	2	....	...	36	23	61	.....	45	15	....	....	60	1,642	27.3	1
Tertiary	3	....	...	11	2	16	.....	14	2	....	....	16	603	37.5	....
Tetanus	.....	....	...	2	.....	2	.....	.....	.....	....	2	2	3	1.5	....
Tuberculosis	2	....	1	18	18	39	.....	14	19	....	5	38	822	21.5	1
Typhoid fever	2	....	...	27	16	45	29	6	1	....	9	45	1,415	31.4	....
Whooping cough	.....	....	...	1	.....	1	.....	1	.....	....	....	1	11	11	....
Injuries.															
Burn:															
Body	1	....	...	6	5	12	5	4	....	....	3	12	761	63.4	....
Face	.....	....	...	2	1	3	.....	3	....	....	....	3	10	3.3	....
Hand	.....	....	...	2	1	3	1	2	....	....	....	3	74	24.6	....
Leg	1	....	...	3	.....	4	2	2	....	....	....	4	132	33	....
Foreign body:															
Eye	.....	....	...	1	.....	1	1	.....	.....	....	....	1	44	44	....
Hand	.....	....	...	.....	2	2	2	.....	.....	....	....	2	19	9.5	....
Throat	.....	....	...	1	1	2	1	1	....	....	....	2	4	2	....
Wounds:															
Contused—															
Body	.....	2	...	3	6	11	1	7	3	....	....	11	25	2.2	....
Eye	.....	....	...	1	.....	1	.....	1	....	....	....	1	1	1	....
Face	.....	1	...	4	.....	5	3	1	....	....	....	4	25	6.2	1
Hand	.....	....	...	4	1	5	1	3	....	....	....	4	9	2.2	1
Leg	1	....	...	9	.....	10	1	5	1	....	....	7	255	36.4	3

Medical and surgical diseases, except pay patients—Continued.

Disease.	Remaining July 1, 1914.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1915.
		White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Not treated.	Dead.	Total.			
		Male.	Female.	Male.	Female.										
Injuries—Continued.															
Wounds—Continued.															
Gunshot—															
Body	....	....	....	.....	3	3	1	2	....	....	....	3	58	19.3	....
Foot	1	....	....	2	.....	3	1	2	....	....	....	3	156	52	....
Hand	....	....	....	3	.....	3	1	2	....	....	....	3	7	2.3	....
Head	....	1	....	.....	2	3	.....	3	....	....	....	3	24	8	....
Leg	....	1	....	.....	.....	1	.....	1	....	....	....	1	20	20	....
Thigh	....	....	....	2	.....	2	.....	2	....	....	....	2	59	29.5	....
Incised—															
Hand	....	....	....	2	1	3	1	2	....	....	....	3	9	3	....
Face	....	1	....	.....	.....	1	.....	1	....	....	....	1	1	1	....
Scalp	....	....	....	3	.....	3	.....	3	....	....	....	3	14	4.6	....
Thigh	....	....	....	2	.....	2	1	1	....	....	....	2	21	10.5	....
Lacerated—															
Cornea	....	....	....	2	.....	2	1	1	....	....	....	2	23	11.5	....
Face	....	2	....	4	1	7	1	6	....	....	....	7	27	3.8	....
Foot	....	....	....	2	2	4	1	3	....	....	....	4	44	11	....
Hand	....	....	....	4	.....	4	2	2	....	....	....	4	9	2.2	....
Scalp	....	....	....	5	2	7	1	5	1	....	....	7	35	5	....
Punctured—															
Chest	....	....	....	2	1	3	1	1	....	....	....	2	18	9	1
Foot	....	....	....	1	.....	1	1	.....	....	....	....	1	4	4	....
Lymphatic system and peritoneum.															
Adenitis:															
Cervical	3	....	....	13	23	39	8	22	4	....	1	35	1,135	32.4	4
Inguinal	2	....	....	19	7	28	7	16	4	....	....	27	671	24.9	1
Peritonitis	....	....	....	.....	2	2	.....	2	....	....	....	2	53	26.5	....
Petitonitis, tubercular	1	....	....	1	2	4	.....	4	....	....	....	4	129	32.2	....
Nervous system.															
Acute mania	....	....	....	1	2	3	.....	1	2	....	....	3	15	5	....
Chorea	....	....	....	.....	1	1	.....	1	....	....	....	1	66	66	....
Concussion brain	....	....	....	2	1	3	.....	3	....	....	....	3	13	4.3	....
Dementia praecox	....	....	....	1	.....	1	.....	.....	1	....	....	1	9	9	....
Epilepsy	....	3	....	12	6	21	.....	15	6	....	....	21	316	15	....
Hysteria	....	....	....	1	9	10	1	6	3	....	....	10	35	3.5	....
Lateral sclerosis	1	1	....	.....	.....	2	.....	2	....	....	....	2	203	101.5	....
Melancholia	....	....	....	.....	1	1	.....	.....	1	....	....	1	14	14	....
Neurasthenia	....	....	....	3	4	7	.....	6	1	....	....	7	109	15.5	....
Neuritis	....	1	....	2	2	5	1	3	....	....	....	4	76	19	1
Paralysis	2	....	....	13	7	22	.....	12	3	....	3	18	941	52	4
Senile dementia	....	....	....	1	.....	1	.....	.....	1	....	....	1	1	1	....
Syncope	....	....	....	1	.....	1	1	.....	....	....	....	1	1	1	....
Tabes dorsalis	....	....	....	2	.....	2	.....	1	1	....	....	2	25	12.5	....
Obstetrical.															
Births:															
Living	....	1	....	124	154	279	251	.....	....	....	22	273	4,000	14.5	6
Remaining	8	....	....	.....	.....	8	8	.....	....	....	....	8	129	16	....
Babies with mother	2	....	....	6	3	11	.....	.....	....	11	....	11	189	17.1	....
Pregnancy:															
Delivered	11	....	1	.....	293	305	297	.....	....	....	2	299	7,137	23.8	6
Undelivered	1	....	....	.....	39	40	.....	.....	35	....	....	35	183	5.1	5
Puerperal:															
Eclampsia	....	....	....	.....	2	2	.....	.....	....	....	2	2	2	1	....
Sepsis	....	....	....	.....	4	4	2	.....	....	....	1	3	21	7	1
Puerperium	8	....	....	.....	5	13	12	1	....	....	....	13	273	21	....
Poisoning.															
Alcoholism:															
Acute	....	11	....	13	4	28	8	17	1	....	1	27	73	2.7	1
Chronic	....	1	....	3	1	5	1	3	....	....	1	5	103	20.6	....
Autointoxication	....	1	....	3	6	10	4	5	1	....	....	10	85	8.5	....
Benzine	....	....	....	1	.....	1	1	.....	....	....	....	1	4	4	....

Medical and surgical diseases, except pay patients—Continued.

Disease.	Remaining July 1, 1914.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1915.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Dead.	Total.			
Poisoning—Contd.															
Gas		1			1	2	1	1				2	4	2	
Mercury				1	2	3	2	1				3	69	23	
Morphine				2		2		1	1			2	21	10.5	
Sunstroke		1		2		3	2	1				3	4	1.3	
Respiratory system.															
Bronchial asthma		1		2	3	6	1	4				5	70	14	1
Bronchitis:															
Acute				17	4	21	7	12				19	193	10.1	2
Chronic				3		3		3				3	45	15	
Edema glottis				1		1	1					1	6	6	
Edema lung				1		1	1					1	1	1	
Laryngitis				1		1		1				1	4	4	
Pleura:															
Acute pleurisy				10	5	15	4	7	2			13	311	23.9	2
Chronic pleurisy				3		3		2			1	3	89	29.6	
Empyema				5	1	6		4			2	6	203	33.8	
Tracheobronchial stenosis				1		1		1				1	24	24	
Skin.															
Dermatitis				1	2	3	1	2				3	29	9.6	
Eczema	3				1	4	1	3				4	232	58	
Frost bite		1		5	1	7	3	3				6	267	44.5	1
Leukoderma				1		1			1			1	4	4	
Pediculosis capitis					1	1	1					1	10	10	
Pemphigus					1	1					1	1	6	6	
Tumors and hypertrophies.															
Angioma				1		1		1				1	5	5	
Carcinoma:															
Breast	2				17	19	5	8	2		3	18	547	30.3	1
Foot					1	1					1	1	25	25	
Gall bladder				1	1	2		2				2	64	32	
Lip		1				1									1
Prostate	1					1					1	1	75	75	
Rectum				1	2	3		1	1		1	3	52	75	
Tongue				1		1			1			1	1	1	
Condylomata				2	1	3		3				3	27	9	
Cyst Bartholin gland					1	1			1			1	20	20	
Cyst thyroglossal duct					1	1	1					1	16	16	
Cyst breast					2	2	2					2	27	13.5	
Dermoid cyst				1	1	2	2					2	27	13.5	
Fibroma skin				5	3	8	4	3	1			8	69	8.6	
Ganglion					1	1		1				1	6	6	
Goitre:															
Exophthalmic					4	4		2	1			3	33	11	1
Simple				1	9	10	7	2				9	123	13.5	1
Lipoma: Back				1	3	4	2	2				4	64	16	
Pancreatic cyst				1		1					1	1	32	32	
Papilloma bladder				2		2	1	1				2	127	63	
Papilloma eyelid					1	1		1				1	8	8	
Ranula				1		1			1			1	1	1	
Sebaceous cyst					2	2	2					2	136	68	
Sarcoma:															
Femur				3	1	4		4				4	209	52.2	
Inferior maxilla				1		1					1	1	131	131	
Rectum				1		1			1			1	31	31	
Retroperitoneal	1			1		2		1	1			2	51	25.5	
Shoulder				1		1		1				1	17	17	
Testicle				1		1	1					1	17	17	
Total	181	51	9	1,306	1,697	3,244	1,407	1,173	250	11	237	3,078			166
Stillbirths				15	13	28									

Medical and surgical diseases, pay patients.

Disease.	Remaining July 1, 1914.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1915.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Dead.	Total.			
Abscess, jaw					1	1		1				1	3	3	
Adenoma, breast					2	2	2					2	23	11.5	
Autointoxication					1	1		1				1	7	7	
Appendicitis				3	10	13	6	5			1	12	152	12.5	1
Births	1			13	15	29	27				2	29	358	12.3	
Bronchitis				1		1		1				1	16	16	
Burn, foot					1	1		1				1	38	38	
Carcinoma:															
Breast					1	1		1				1	21	21	
Cervix					3	3		3				3	46	15.3	
Intestine				2		2					2	2	16	8	
Pancreas					1	1		1				1	35	35	
Stomach					2	2			1		1	2	5	2.5	
Cataract				1	2	3	1	2				3	35	11.6	
Cerebral hemorrhage				1		1		1				1	21	21	
Cervical adenitis					1	1	1					1	11	11	
Cholelithiasis					1	1	1					1	41	41	
Cirrhosis liver					1	1					1	1	4	4	
Contused wound thorax					1	1	1					1	26	26	
Delirium tremens				1		1		1				1	2	2	
Dysmenorrhea					1	1		1				1	14	14	
Ectopic gestation					2	2	2					2	39	19.5	
Endometritis					1	1	1					1	10	10	
Enterocolitis			1			1					1	1	9	9	
Epididymitis				2		2	1	1				2	14	7	
Fibroma uteri	1				28	29	19	5	1		1	26	481	18.5	3
Fistula in ano				1		1		1				1	7	7	
Goiter				1	1	2	1	1				2	14	7	
Gunshot wound, eye				3		3		2				2	49	24.5	1
Hemiplegia				2		2		2				2	35	17.5	
Hysteria				1		1		1				1	7	7	
Inguinal hernia		1		1		2	1	1				2	34	17	
Intestinal obstruction				2	1	3	1	1			1	3	51	17	
Ischiorectal abscess				5	2	7	2	4				6	74		1
Fracture:															
Clavicle				1	1	2		1				1	10	10	1
Femur				1		1		1				1	7	7	
Rib					1	1			1			1	5	5	
Tibia				1		1		1				1	7	7	
Gastritis				1	2	3	1	1	1			3	36	12	
Hemorrhoids		1		2	1	4	2	2				4	30	7.5	
Lacerated wound, scalp				1		1	1					1	4	4	
Meningitis			1			1					1	1	2	2	
Miscarriage					4	4	3	1				4	32	8	
Neurasthenia				1	4	5		5				5	81	16.2	
Ovarian cyst					2	2	2					2	48	24	
Prostatitis				4		4	1		1			2	46	23	2
Peritonsillar abscess				2		2	2					2	5	2.5	
Periurethral abscess				1		1	1					1	21	21	
Pleurisy				3		3		3				3	78	26	
Sacro-iliac subluxation					1	1	1					1	6	6	
Senile gangrene, foot				1		1	1					1	56	56	
Senility					1	1			1			1	51	51	
Spur os calcis				1		1	1					1	14	14	
Thrombophlebitis					1	1		1				1	28	28	
Tonsillitis:															
Acute					2	2		2				2	14	7	
Chronic				10	6	16	16					16	30	1.7	
Turbinates					1	1		1				1	7	7	
Inguinal adenitis				2		2	1	1				2	43	21.5	
Lacerated cervix					1	1	1					1	13	13	
Lacerated perineum					1	1		1				1	14	14	
Lipoma, neck				1		1		1				1	7	7	
Mitral insufficiency				4	2	6		6				6	150	25	
Nephritis	1			8	7	16	1	8	2		4	15	365	24.3	1
Papilloma, eyelid					1	1		1				1	2	2	
Melancholia	1					1			1			1	20	20	
Periostitis	1					1		1				1	18	18	
Pneumonia				3		3		1			2	3	13	4.3	

Medical and surgical diseases, pay patients—Continued.

Disease.	Remaining July 1, 1914.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1915.
		White.		Colored.											
		Male.	Female.	Male.	Female.	Total.	Recovered.	Improved.	Unimproved.	Not treated.	Dead.	Total.			
Pregnancy	....	....	....	....	32	32	30	.....	1	....	....	31	430	13.9	1
Procidentia	....	....	....	....	1	1	1	.....	....	....	....	1	14	14	....
Puerperal sepsis	....	....	....	....	3	3	.....	1	....	....	2	3	20	6.6	....
Puerperium	1	....	....	.....	.....	1	1	.....	....	....	....	1	13	13	....
Rheumatism	....	....	....	.....	2	2	.....	1	....	....	....	1	14	14	1
Salpingitis	....	....	....	.....	16	16	7	7	....	....	....	14	237	16.9	2
Sarcoma	....	....	....	1	.....	1	.....	1	1	....	....	1	9	9	....
Stricture of rectum	....	....	....	1	2	3	1	2	....	....	....	3	42	14	....
Stricture of urethra	....	....	....	1	.....	1	.....	1	....	....	....	1	13	13	....
Toxemia of pregnancy	....	....	....	.....	1	1	1	.....	....	....	....	1	28	28	....
Typhoid fever	....	....	....	5	1	6	3	2	....	....	....	5	164	32.8	1
Tuberculosis	....	....	....	.....	1	1	.....	1	....	....	....	1	13	13	....
Unruptured hymen	....	....	....	.....	1	1	1	.....	....	....	....	1	7	7	....
Urethral carbuncle	....	....	....	.....	1	1	.....	1	....	....	....	1	3	3	....
Varicose ulcer	....	....	....	.....	1	1	.....	1	....	....	....	1	25	25	....
X-ray photo	....	....	....	2	3	5	5	.....	....	....	....	5	1	.....	....
Total	6	2	2	98	183	291	152	94	11	....	19	276	.....	.....	15
Stillbirths	....	....	....	3	.....	.....	.....	.....	.....	....	.....	.....	.....	.....	....

Operations and results, all patients.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Adenectomy	Adenitis:									
	Cervical	....	....	3	4	12	2	10	....	....
	Femoral	1	....	.....	.....	1	1	.....	....	....
	Inguinal	1	....	6	5	12	4	8	....	....
Adenoidectomy	Adenoids	....	....	73	31	104	80	24	....	....
Amputation:										
Breast	Carcinoma	....	....	.....	2	2	....	2	....	....
Cervix	....do	....	....	.....	1	1	.....	1	....	....
	Cystic degeneration	....	....	.....	1	1	1	.....	....	....
	Hypertrophy	....	....	.....	3	3	2	1	....	....
Finger	Infected	....	....	.....	2	2	2	.....	....	....
Foot	Gangrene	....	....	5	.....	5	4	1	....	....
Leg	....do	....	....	2	.....	2	1	.....	....	1
Toes	....do	....	....	4	.....	4	....	4	....	....
Cauterization:										
Cervix	Carcinoma	....	....	.....	4	4	....	4	....	....
Rectum	....do	....	....	1	1	2	....	2	....	....
	Dacryocystitis	....	....	.....	1	1	....	1	....	....
	Chancroid of vagina	....	....	.....	2	2	1	1	....	....
	Tumor of sclerocorneal margin	....	....	1	1	1	....	.....	....	....
Celiotomy:										
Appendicectomy	Appendiceal abscess	....	....	1	1	2	2	.....	....	....
	Acute gangrenous perforative appendicitis	....	....	4	4	8	2	4	....	2
	Acute catarrhal appendicitis	....	....	3	6	9	8	1	....	....
	Acute catarrhal appendicitis with tuberculosis of mesenteric glands	....	....	1	.....	1	....	.....	....	1
	Chronic appendicitis	....	1	17	57	75	53	19	....	3
Cæsarian section	Contracted pelvis	....	....	.....	3	3	1	1	....	1
	Eclampsia, puerperal	....	....	.....	3	3	1	.....	....	2
	Gunshot wound through pregnant uterus	....	....	.....	1	1	....	1	....	....
Cholecystectomy	Cholelithiasis and chronic cholecystitis	....	....	2	2	4	3	1	....	....
Cholecystostomy	Cholelithiasis	....	1	.....	6	7	4	1	....	2
	Cholecystitis	....	....	1	.....	1	....	1	....	....
	Chronic pancreatitis	....	....	1	.....	1	....	1	....	....

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Cystotomy	Urethral calculus	....	....	1	.....	1	1	.....	....	....
	Vesical calculus	....	....	1	2	3	3	.....	....	....
	Papilloma of bladder	....	....	1	.....	1	1	.....	....	....
Enterostomy	Intestinal paresis	....	....	.....	4	4	....	.....	....	4
Exploratory	Carcinoma:									
	Pancreas	....	....	1	1	2	....	.....	2	....
	Pancreas, liver and gall bladder	....	....	.....	1	1	....	.....	1	....
	Sigmoid	....	....	1	.....	1	....	.....	....	1
	Cholecystitis	....	....	.....	1	1	....	1	....	....
	Foreign body in uterus (hatpin)	....	....	.....	1	1	....	1	....	....
	General carcinomatosis	....	....	.....	2	2	....	.....	1	1
	Gunshot wound	....	....	2	.....	2	....	2	....	....
	Hepatitis (leutic)	....	....	1	.....	1	....	.....	1	....
	Malignant degeneration of fibroid uterus	....	....	.....	1	1	....	.....	....	1
	Peritonitis, tuberculosis	....	....	.....	1	1	....	1	....	....
	Pregnancy with omentum adhered to uterus	....	....	.....	2	2	....	2	....	....
	Tuberculosis of intestines and mesenteric glands	....	....	1	.....	1	....	1	....	....
Freeing of adhesions	Abdominal adhesions	....	....	1	7	8	5	3	....	....
	Post operative adhesions	....	....	.....	2	2	2	.....	....	....
	Volvulus	....	....	.....	1	1	1	.....	....	....
Gastroenterostomy (posterior)	Carcinoma pancreas	....	....	.....	1	1	....	.....	....	1
	Duodenal ulcer	....	....	.....	1	1	1	.....	....	....
	Gastric ulcer	....	....	1	3	4	3	1	....	....
	Gastroptosis	....	....	.....	1	1	1	.....	....	....
Hysterectomy (supravaginal).	Fibroma uteri	....	....	.....	33	33	27	4	....	2
	Metritic uterus, chronic	....	....	.....	5	5	3	2	....	....
	Myofibroma of uterus	....	....	.....	2	2	1	1	....	....
	Ruptured uterus	....	....	.....	1	1	1	.....	....	....
Hysterectomy (vaginal)	Hypertrophied cervix	....	....	.....	2	2	....	2	....	....
	Procidentia (complete)	....	....	.....	2	2	2	.....	....	....
Hysterosalpingo-oophorectomy.	Abscess:									
	Ovarian	....	....	.....	1	1	1	.....	....	....
	Tubo-ovarian	....	....	.....	3	3	2	1	....	....
	Cysts, ovarian	....	....	.....	1	1	1	.....	....	....
	Ectopic and metritic uterus	....	....	.....	2	2	2	.....	....	....
	Ectopic and pyosalpinx	....	....	.....	1	1	1	.....	....	....
	Fibrocystic ovaries	....	....	.....	1	1	....	.....	....	1
	Fibroid uterus and cystic ovaries.	....	....	.....	42	42	32	9	....	1
	Fibroid uterus and complicating pregnancy.	....	....	.....	1	1	1	.....	....	....
	Fibroid uterus and hydrosalpinx.	....	....	.....	2	2	2	.....	....	....
	Fibroid uterus and intraligamentous cysts.	....	....	.....	2	2	2	.....	....	....
	Fibroid uterus and pyosalpinx	....	....	.....	21	21	15	6	....	....
	Fibroid uterus and salpingitis	....	....	.....	15	15	10	3	....	2
	Myomatous uterus and pyosalpinx.	....	....	.....	3	3	2	1	....	....
	Metritis and cystic ovaries	....	....	.....	2	2	2	.....	....	....
	Metritis and salpingitis	....	....	.....	9	9	6	3	....	....
	Pyosalpinx (bilateral)	....	....	.....	31	31	24	6	....	1
	Salpingitis and ovaritis	....	....	.....	4	4	3	1	....	....
	Salpingitis and subinvoluted uterus.	....	....	.....	1	1	1	.....	....	....
Hysterosalpingectomy	Metritis and salpingitis	....	....	.....	1	1	1	.....	....	....
	Myomatous uterus and cysts of broad ligament.	....	....	.....	1	1	1	.....	....	....
Hystero-oophorectomy	Metritis and cystic ovary	....	....	.....	2	2	2	.....	....	....
Oophorectomy	Cystic ovaries	....	....	.....	6	6	4	2	....	....
Salpingo-oophrectomy	Dermoid cyst (ovarian)	....	....	.....	2	2	2	.....	....	....
	Ectopic gestation (ovarian)	....	....	.....	1	1	1	.....	....	....
	Ectopic gestation (tubal)	....	....	.....	7	7	3	4	....	....
	Hydrosalpinx and cystic ovaries.	....	....	.....	5	5	4	1	....	....
	Ovarian cyst	....	....	.....	2	2	2	.....	....	....
	Parovarian cyst	....	....	.....	1	1	1	.....	....	....
	Pyosalpinx and cystic ovaries	....	1	.....	18	19	11	8	....	....
	Salpingitis and cystic ovaries	....	1	.....	60	61	48	13	....	....
	Tubo-ovarian abscess	....	....	.....	1	1	1	.....	....	....

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Salpingectomy	Salpingitis	....	....	.....	7	7	5	2	....	....
Panhysterectomy	Carcinoma of cervix	....	....	.....	4	4	....	4	....	....
	Fibroid uterus	....	....	.....	4	4	2	2	....	....
	Ovarian cysts (multiple)	....	....	.....	1	1	....	1	....	....
	Pyosalpinx (bilateral)	....	....	.....	2	2	1	.....	....	1
	Tubal pregnancy (ruptured) with fibroid uterus and cystic ovaries.	....	....	.....	1	1	1	.....	....	....
Circumcision	Elongated prepuce	....	....	7	.....	7	7	.....	....	....
	Paraphimosis	....	....	1	.....	1	1	.....	....	....
	Phimosis	....	....	36	.....	36	32	4	....	....
Curetment	Abscess:									
	Antrum of Highmore	....	....	.....	1	1	....	1	....	....
	Peri-rectal	....	....	1	.....	1	1	.....	....	....
	Adenitis (cervical)	....	....	1	.....	1	....	1	....	....
	Chancroids	....	....	2	.....	2	1	1	....	....
	Dysmenorrhea	....	....	.....	1	1	....	1	....	....
	Endometritis	....	1	.....	17	18	12	6	....	....
	Endocervicitis	....	....	.....	3	3	1	2	....	....
	Fistula, rectal	....	....	.....	1	1	....	1	....	....
	Granulations	....	....	4	.....	4	2	2	....	....
	Metrorhagia	....	....	.....	1	1	....	1	....	....
	Osteomyelitis	....	....	4	1	5	....	5	....	....
	Secundines, retained	....	....	.....	17	17	14	3	....	....
	Syphilis, testicle	....	....	1	.....	1	....	1	....	....
	Varicose ulcer of leg	....	....	.....	1	1	....	1	....	....
Dilatation:										
	Fissure in ano	....	....	1	3	4	2	2	....	....
	Neurasthenia	....	....	1	.....	1	1	.....	....	....
	Stricture of rectum	....	....	1	2	3	1	2	....	....
Urethra	Stricture of urethra	....	....	7	.....	7	2	4	....	1
Vagina	Stenosis of vagina	....	....	.....	1	1	....	1	....	....
Enucleation	Adenoma (breast)	....	....	.....	2	2	2	.....	....	....
	Cysts (breast)	....	....	.....	1	1	1	.....	....	....
Eye	Foreign body in eye	....	....	1	.....	1	1	.....	....	....
	Glaucoma	....	....	1	.....	1	....	1	....	....
	Iridocyclitis (complete)	....	....	1	.....	1	....	1	....	....
	Panophthalmitis	....	....	1	1	2	2	.....	....	....
	Staphyloma	....	....	1	1	2	2	.....	....	....
	Ulcer (corneal with loss of vision).	....	....	.....	1	1	1	.....	....	....
Tumor	Lipoma (back)	....	....	.....	3	3	2	1	....	....
	Lipoma (shoulder)	....	....	1	2	3	3	.....	....	....
	Thyroglossal cyst	....	....	.....	1	1	1	.....	....	....
Epididymectomy	Epididymitis (Tb.)	....	....	5	.....	5	3	1	....	1
	Epididymitis (gonorrheal)	....	....	4	.....	4	1	3	....	....
Epididymotomy	Epididymitis (gonorrheal)	....	....	1	.....	1	....	1	....	....
Excision	Adenoma	....	....	1	1	2	2	.....	....	....
Villi	Arthritis (chr. villous)	....	....	1	1	2	....	2	....	....
	Coruncle (urethral)	....	....	.....	1	1	1	.....	....	....
	Epithelioma, lower jaw	....	....	.....	1	1	.....	.....	....	1
Tract	Fistula in ano	....	....	8	7	15	6	9	....	....
Sac	Hydrocele	....	....	3	.....	3	3	.....	....	....
	Ovarian cyst	....	....	.....	2	2	....	2	....	....
	Jackson's membrane	....	....	.....	1	1	1	.....	....	....
	Neuro-fibroma	....	....	1	.....	1	1	.....	....	....
	Papilloma (eyelid)	....	....	.....	2	2	....	2	....	....
Sinus	Periostitis and sinus	....	....	1	.....	1	....	1	....	....
	Rectal polypus	....	....	2	1	3	3	.....	....	....
	Sebaceous cyst	....	....	1	1	2	2	.....	....	....
	Sarcoma:									
	Fibula	....	....	1	.....	1	....	.....	....	1
	Lower jaw	....	....	1	.....	1	....	1	....	....
	Shoulder	....	....	1	.....	1	....	1	....	....
	Thigh	....	....	2	1	3	....	3	....	....
	Spur of os calcis	....	....	1	.....	1	1	.....	....	....
	Varicocele	....	....	1	.....	1	1	.....	....	....
Veins	Varicose veins	....	....	2	5	7	3	4	....	....
	Varicose ulcer	....	....	1	2	3	1	2	....	....
	Venus angioma	....	....	1	.....	1	....	1	....	....
Extraction	Cataract	....	....	8	6	14	....	14	....	....
	Cyst (orbital)	....	....	.....	2	2	2	.....	....	....
	Chalazion	....	....	.....	1	1	....	1	....	....

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Extraction (continued)..	Foreign body:									
	Foot			3		3	3			
	Hand			5	8	13	10	3		
	Radius (bullet)			1		1	1			
	Thigh			1		1		1		
Hemorrhoidectomy	Hemorrhoids:									
	External			8	6	14	12	2		
	Internal			7	5	12	7	5		
	External and internal	2		3		5	5			
Hernioplasty	Hernia:									
	Inguinal, direct	1		27	1	29	22	7		
	Inguinal, indirect			25	4	29	18	11		
	Inguinal and hydrocele of cord.			1		1	1			
	Incisional			1	4	5	2	3		
	Femoral				1	1	1			
	Umbilical			4	2	6	6			
	Baknocele			1		1	1			
Incision and drain	Abscess:									
	Alveolar				1	1		1		
	Cervical			3	2	5		5		
	Chest wall			1		1		1		
	Finger				1	1		1		
	Ischio-rectal			6	5	11	2	9		
	Inguinal			3		3	3			
	Knee joint			1		1		1		
	Leg			1	1	2		2		
	Psoas			1		1		1		
	Perineal			1		1	1			
	Pelvic			4	9	13	11	2		
	Peri-tonsillas			1		1		1		
	Peri-urethral			3	1	4	2	2		
	Right frontal lobe of brain				1	1				1
	Sentum			1		1	1			
	Septum (nasal)				1	1		1		
	Thigh			2		2		2		
	Thyroid gland			1		1		1		
	Vulvovaginal				2	2	2			
	Cellulitis:									
	Arm	2		8	4	14		14		
	Cervical				4	4	4			
	Foot			3		3	3			
	Hand	3		25	20	48	20	28		
	Fistula in ano			8	2	10	8	2		
	Phimosis (chancroidal)			6		6	1	5		
	Prepotellar bursitis			3	2	5	2	3		
	Stricture of rectum				2	2		2		
Iridectomy	Cataract			2	4	6		6		
	Glaucoma			4		4		4		
	Iridocyclitis			1		1		1		
Ligation (partial):										
Common carotid	Aneurysm of common carotid artery.				1	1		1		
Common carotid	Sarcoma, lower jaw			1		1		1		
External carotid	Varicose vein and ulcer				1	1		1		
Lithotomy (uretero)	Urethral calculus			2		2	2			
Mastoidectomy	Mastoiditis			2		2		2		
Manipulation	Ankylosis:									
	Ankle joint			1		1		1		
	Elbow joint			4	3	7		7		
	Knee joint			1	3	4		4		
	Sacro-iliac joint			2	1	3		3		
	Subacromial bursitis joint				1	1		1		
	Shoulder	1				1		1		
	Wrist			1		1		1		
Needling	Cataract			2	2	4		4		
	Keratitis				1	1		1		
Nephrectomy	Tuberculous kidney	1		1	1	3		3		
	Urinary fistulae				1	1		1		
	Pyronephrosis			1		1		1		
Orchidectomy	Sarcoma of testicle			2		2		2		
	Tuberculosis of testicle			1		1		1		
	Undescended testicle			1		1		1		
Osteotomy	Frontal sinusitis			1		1		1		
	Genu valgum			2	2	4	1	3		
	Osteomyelitis			3	4	7	4	3		
	Sinusitis (maxillary)			6		6		6		

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Posterior colpotomy	Cystic ovary	....	....	.....	1	1	1	.....	....	....
	Pelvic abscess	....	....	.....	2	2	1	1	....	....
	Ruptured ectopic	....	....	.....	1	1	....	.....	....	1
Perineal section	Urethral stricture	....	....	4	.....	4	1	3	....	....
Perineorrhaphy	Lacerated perineum	....	1	.....	17	18	10	8	....	....
Plaxtic	Ankylosis of elbow joint	....	....	.....	1	1	....	1	....	....
	Atresia ani	....	....	1	.....	1	....	1	....	....
	Cystic ovaries	....	....	.....	6	6	2	4	....	....
	Chancroid of penis	....	....	1	.....	1	....	1	....	....
	Dilated inguinal rings	....	....	.....	2	2	2	.....	....	....
	Depression of nasal bone	....	....	.....	1	1	1	.....	....	....
	Incisional hernia	....	....	2	2	4	3	1	....	....
	Lacerated wounds	....	....	2	.....	2	....	2	....	....
	Paraphimosis	....	....	1	.....	1	....	1	....	....
	Recto-vesico-vaginal fistula	....	....	.....	1	1	....	1	....	....
	Relaxed sphincter ani, due to operation for fistula in ano.	....	....	.....	1	1	....	.....	....	1
	Undescended testicle	....	....	3	.....	3	....	3	....	....
	Vesico-vaginal fistula	....	....	.....	2	2	2	.....	....	....
Prostatectomy	Carcinoma of prostate	....	....	1	.....	1	....	.....	....	1
	Hypertrophied prostate	....	....	5	.....	5	1	3	....	1
	Prostatic obstruction	....	....	3	.....	3	1	2	....	....
Radical	Carcinoma of breast	....	....	.....	11	11	....	10	....	1
Reduction and fixation.	Dislocation:									
	Head of humerus	....	....	1	.....	1	....	1	....	....
	Head of radius	....	....	1	2	3	3	.....	....	....
	Lower jaw	....	....	1	1	2	1	1	....	....
	Fracture:									
	Clavicle	....	....	2	2	4	....	4	....	....
	Colle's	....	....	5	5	10	....	10	....	....
	Fibula	2	....	.....	1	3	....	3	....	....
	Finger	2	....	4	4	10	....	10	....	....
	Femur	....	....	2	2	4	....	2	....	2
	Hand	....	2	.....	.....	2	....	2	....	....
	Humerus	....	....	1	1	2	....	2	....	....
	Patella	1	....	2	.....	3	....	3	....	....
	Pott's	....	....	4	.....	4	....	3	....	1
	Tibia	1	....	2	.....	3	....	3	....	....
	Tibia and fibula	1	....	1	.....	2	....	2	....	....
	Ulna and radius	....	....	2	1	3	1	2	....	....
	Ulna	....	....	1	2	3	....	3	....	....
Resection:										
Intestines	Intestinal obstruction	....	....	.....	3	3	1	1	....	1
Rib	Empyema	....	....	.....	2	2	1	1	....	....
Astragalus	Osteomyelitis	....	....	1	.....	1	....	1	....	....
Tibia	Osteosarcoma	....	....	1	.....	1	....	1	....	....
Sac	Ovarian cyst	....	....	.....	1	1	....	1	....	....
Intestines	Rupture of sigmoid	....	....	.....	1	1	....	.....	....	1
Removal	Bullet (condyle humerous)	....	....	1	.....	1	1	.....	....	....
	Bullet (hand)	....	....	1	.....	1	1	.....	....	....
	Fibro-adenoma (breast)	....	....	.....	1	1	1	.....	....	....
	Fibroma (foot)	....	....	1	.....	1	1	.....	....	....
	Fibro-myoma (gluteal region)	....	....	.....	1	1	1	.....	....	....
	Infected Bartholin's gland	....	....	.....	3	3	2	1	....	....
	Ingrowing toenail	....	....	2	2	4	4	.....	....	....
	Inguinal and femoral glands (enlarged and carcinomatous).	....	....	.....	1	1	....	.....	....	1
Of obstruction	Intestinal obstruction	....	....	5	1	6	2	2	....	2
	Lipoma (neck)	....	....	.....	2	2	2	.....	....	....
	Lipoma (back)	....	....	.....	3	3	3	.....	....	....
Reversal of circulation	Thrombus (popliteal artery)	....	....	.....	1	1	....	.....	....	1
Skin graft	Burns (third degree)	....	....	2	.....	2	....	2	....	....
	Traumatic ulcer	....	....	3	.....	3	....	2	1	....
Suspension	Anteflexed uterus	....	....	.....	3	3	2	1	....	....
Suturing	Dilated sphincter of rectum	....	....	.....	1	1	1	.....	....	....
	Incised wounds:									
	Arm	....	....	16	9	25	....	25	....	....
	Back	5	....	2	.....	7	....	7	....	....
	Chest	....	....	1	.....	1	....	1	....	....
	Face	17	2	51	25	95	....	95	....	....
	Finger	21	....	89	45	155	....	155	....	....
	Foot	8	2	34	21	65	....	65	....	....
	Hand	11	2	31	16	60	....	60	....	....
	Knee	....	....	6	.....	6	....	6	....	....
	Leg	6	....	6	.....	12	....	12	....	....
	Scalp	16	1	145	19	181	....	181	....	....
	Thigh	....	....	6	1	7	....	7	....	....

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Suturing (continued)	Lacerated eyelid	3	2	10	9	24	....	24	....	....
	Perforated intestine	....	....	1	.....	1	.....	.....	1	....
	Ruptured iliac artery	1	....	.....	.....	1	1	.....	....	....
Tenotomy	Internal strabismus	....	....	2	.....	2	....	2	....	....
Thoracotomy	Empyema	....	....	1	1	2	....	2	....	....
Thyroidectomy	Goiter (simple)	....	....	.....	6	6	5	1	....	....
	Goiter (parmehymatus)	....	....	.....	2	2	....	2	....	....
	Hyperthyroidism	....	....	.....	3	3	2	1	....	....
Tonsillectomy	Faucial, hypertrophied	....	....	151	58	209	185	24	....	....
Trachelorrhaphy	Lacerated cervix	....	....	.....	7	7	2	5	....	....
Trephine	Cebral compression	....	....	.....	2	2	1	1	....	....
	Depressed fracture of skull	2	....	.....	1	3	....	2	....	1
	Glaucoma	....	....	8	4	12	....	12	....	....
	Infantile paraplegia	....	....	1	.....	1	....	.....	....	1
	Cataract	....	....	.....	4	4	....	4	....	....
	Iritis (bilat)	....	....	1	.....	1	....	1	....	....
Turbinectomy	Hypertrophied turbinates	....	....	8	5	13	....	13	....	....
Urethrotomy (exterior)	Urethral stricture	....	....	1	.....	1	1	.....	....	....
Uvulotomy	Elongated uvula	....	....	9	12	21	21	.....	....	....
Ventro-suspension	Retroverted uterus	....	....	.....	6	6	4	2	....	....
Wiring of bones	Patella (fracture)	....	....	2	.....	2	1	1	....	....
	Symphisis pubis (separation)	....	....	1	.....	1	1	.....	....	....
Total		109	17	1,118	1,052	2,296	978	1,261	8	49

Obstetrical record, all patients.

Month.	White.		Colored.		Total.	Eclampsia.	Cæsarean section.	Podalic version.	Lacerations.	Post partum hemorrhage.	Stillbirths.	Twins.	Head.	Breech.	Foot.	Forceps.	Primipara.	Multipara.
	Male.	Female.	Male.	Female.														
July	....	....	8	15	23	....	....	....	9	....	6	....	22	1	....	....	11	12
August	....	....	14	15	29	....	....	....	15	....	3	....	28	....	1	2	13	16
September	....	....	8	15	23	....	....	....	15	....	....	....	22	....	1	....	10	13
October	....	....	14	13	27	....	....	....	11	....	2	....	27	....	....	....	10	17
November	....	....	12	10	22	....	....	....	9	....	1	....	22	....	....	....	13	9
December	....	....	15	12	27	1	1	....	10	....	2	....	26	....	1	1	16	11
January	....	....	11	14	25	....	1	....	11	....	1	....	25	....	....	....	12	13
February	....	....	12	17	29	....	....	....	11	....	5	....	27	....	2	....	15	14
March	....	....	12	17	29	....	....	....	10	....	3	....	29	....	....	....	14	15
April	....	....	13	9	22	....	....	....	11	....	2	....	21	....	1	....	9	13
May	1	....	10	19	30	....	....	....	16	....	....	....	28	....	2	....	19	11
June	....	....	10	11	21	....	1	....	9	....	3	2	18	1	2	1	10	9
Total	1	....	139	167	307	1	3	....	137	....	28	2	295	2	10	4	152	153

Anesthetics, all patients.

	Admitted.				Total.
	White.		Colored.		
	Male.	Female.	Male.	Female.	
General:					
Ether	12	3	592	673	1,280
Chloroform	2	.....	11	55	18
Chloroform and ether	.....	.....	4	.....	4
Cocaine and ether	.....	.....	5	.....	5
Cocaine, novocaine, and nitrous oxide	.....	.....	.....	1	1
Cocaine, novocaine, and ether	.....	.....	4	.....	4
Nitrous oxide	1	.....	5	13	19
Nitrous oxide and ether	3	5	80	200	288
Local:					
Cocaine	3	9	50	28	90
Cocaine and novocaine	.....	.....	20	10	30
Novocaine	.....	.....	27	13	40
Total	21	17	798	943	1,779

This branch of the service is increasing so rapidly that it is utterly impossible for a single anesthetist to administer all anesthetics, and until an assistant anesthetist is provided it will be necessary to continue the unsatisfactory practice of detailing internes, who have other duties to perform, to assist in this important work.

Laboratory work.

	1915	1914		1915	1914
White cell counts	284	232	Examination of sputum	202	123
Red cell counts	62	47	Autopsies	23	13
Hemaglobin estimates	91	93	Museum specimens	26	20
Widal reactions	110	117	Microscopical sections	355	410
Malarial examinations	23	12	Wasserman reactions (noguchi modifications)	853	634
Urinalyses	2,496	2,414			

Thirty-four and forty-six one-hundredths per cent of the Wasserman's examinations were positive, 59.9 per cent were negative, 5.62 per cent were doubtful.

Numerous examinations of gastric contents, feces, bacteriological smears and cultures, differential counts, blood cultures, coagulation estimates, and vaccines were also made.

Radiographs.

Head and cervical vertebræ	41	Feet and ankles	91
Wrists and hands	69	Abdomens	102
Shoulders	33	Tibias and fibulas	65
Hips and pelvis	53	Spines	27
Elbows	35	Kidneys, ureters and bladders	65
Knees	76	Forearms	5
Chests	100		
Femurs	22	Total	784

X-ray treatments.

Disease.	Cases.	Treatments.	Cured.	Improved.	Unimproved.	Total.
Eczema	4	8	2	2	.....	16
Keloids	6	20	3	2	1	32
Luetic glands	2	3	.....	.....	2	7
T. B. adenitis	11	62	7	3	1	84
Ringworm (scalp)	1	1	1	.....	.....	3
Exophthalmic goiter	1	3	.....	.....	1	5
Hirsuties	1	2	.....	.....	1	4
Pruritis vulva	1	1	1	.....	.....	3
Acne and hypertrichasis	1	1	.....	1	.....	3
Granulating wound (foot)	1	1	.....	.....	1	3
Splenomyelogenous leukemia	1	2	.....	1	.....	4
Psoriasis	1	4	.....	.....	1	6
Simple ulcer (leg)	1	3	.....	.....	1	5
Enlarged thymus	1	1	.....	.....	1	3
Luetic ulcer	1	3	.....	.....	1	5
Total	34	115	14	10	10	183

Nativity, except pay patients.

Nativities.	White.		Colored.		Nativities.	White.		Colored.	
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.
Alabama	....	....	5	4	New Jersey	1	....	4	.....
Arizona	....	....	1	.....	New York	1	....	13	8
Arkansas	....	....	.....	1	North Carolina	2	....	56	62
California	....	....	1	1	Ohio	....	....	10	3
Connecticut	....	....	2	.....	Oklahoma	....	....	1	.....
District of Columbia	19	2	424	591	Oregon	1	....	.....	.....
Delaware	....	....	5	6	Pennsylvania	....	....	23	19
Florida	....	....	5	5	Rhode Island	....	....	4	3
Georgia	....	....	25	18	South Carolina	....	....	18	28
Illinois	2	....	4	1	Tennessee	....	....	21	7
Indiana	1	....	1	.....	Texas	....	....	4	2
Iowa	....	....	2	.....	Unknown	1	....	3	2
Kansas	....	....	2	.....	Virginia	4	2	366	589
Kentucky	....	....	6	3	West Virginia	....	....	13	2
Maryland	9	2	271	332	British West Indies	....	....	8	4
Massachusetts	4	....	2	2	Germany	1	....	1	.....
Michigan	....	....	.....	1	Italy	2	2	.....	.....
Mississippi	....	1	4	2	Russia	1	....	.....	.....
Missouri	1	....	1	1					
Nebraska	1	....	.....	.....	Total	51	9	1,306	1,697

Occupation, except pay patients.

Occupations.	White.		Colored.		Occupations.	White.		Colored.	
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.
Agent	....	....	2	.....	Matron	....	....	.....	1
Baker	1	....	1	.....	Mechanic	....	....	4	.....
Barber	....	....	20	.....	Merchant	1	....	.....	.....
Bartender	....	....	1	.....	Messenger	1	....	13	.....
Bellman	....	....	9	.....	Milliner	....	1	.....	.....
Blacksmith	....	....	3	.....	Miner	....	....	5	.....
Bootblack	....	....	2	.....	Minister	....	....	5	.....
Bricklayer	2	....	3	.....	Missionary	....	....	1	.....
Butcher	....	....	3	.....	Musician	....	....	2	.....
Butler	....	....	6	.....	No occupation	5	1	309	321
Carpenter	4	....	8	.....	Nursemaid	....	....	.....	48
Chauffeur	....	....	11	.....	Orderly	....	....	8	.....
Clerk	4	....	7	.....	Painter	4	....	5	.....
Coachman	....	....	2	.....	Paper hanger	....	....	1	.....
Cook	....	....	20	81	Physician	....	....	3	.....
Domestic	....	2	.....	821	Plasterer	1	....	4	.....
Dressmaker	....	1	.....	25	Plumber	....	....	2	.....
Driver	2	....	20	.....	Policeman	2	....	.....	.....
Druggist	1	....	.....	.....	Porter	....	....	34	.....
Elevator man	....	....	8	.....	Printer	....	....	1	.....
Engineer	3	....	1	.....	Sailor	....	....	2	.....
Expressman	1	....	3	.....	Salesman	....	....	3	.....
Farmer	....	....	61	.....	Shoemaker	....	....	2	.....
Fireman	....	....	6	.....	Soldier	5	....	3	.....
Fisherman	....	....	4	.....	Student	4	....	162	63
Gardener	....	....	2	.....	Trained nurse	....	....	.....	3
Hairdresser	....	....	.....	3	Teacher	....	....	5	11
Hostler	....	....	1	.....	Tinner	....	....	1	.....
Housekeeper	....	2	.....	95	Undertaker	....	....	2	.....
Housewife	....	2	.....	104	Upholsterer	....	....	2	.....
Huckster	....	....	14	.....	Valet	....	....	1	.....
Janitor	....	....	17	.....	Waiter	....	....	35	6
Jockey	....	....	1	.....	Watchman	2	....	7	.....
Laborer	6	....	445	.....					
Laundress	....	....	.....	116	Total	51	9	1,306	1,697
Machinist	2	....	3	.....					

OUTDOOR SERVICE.

The following tables show the number of medical and surgical diseases treated in the outdoor service:

Medical and surgical diseases—out-patient department.

Diagnosis.	White.		Colored.		Total.	Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.			Male.	Female.	Male.	Female.	
Medical.						*Medical*—Continued.					
Adenitis	....	....	15	8	23	Debility	1	....	5	3	9
Alcoholism	....	....	14	5	19	Debility, senile	....	....	12	2	14
Anemia	....	....	15	25	40	Dyspepsia	....	....	5	12	17
Aneuris	....	....	4	1	5	Diarrhea	....	....	20	21	41
Aortic regurgitation	....	....	15	8	23	Empyema	....	....	1	....	1
Arthritis, infectious	....	....	18	6	24	Febricula	....	....	2	3	5
Arteriosclerosis	....	....	21	11	32	Gastritis:					
Asthma, bronchial	....	....	14	7	21	Acute	....	....	18	7	25
Autointoxication, intestinal	....	....	27	11	38	Chronic	....	....	25	11	36
Bronchitis:						Gastric stasis	....	....	4	7	11
Acute	4	3	65	115	187	Gastric ulcer	....	....	6	3	9
Chronic	....	....	45	25	70	Hemorrhoids	....	....	28	18	46
Cardiac hypertrophy	....	....	4	1	5	Hysteria	....	....	....	10	10
Chorea	....	....	....	5	5	Ileocolitis	....	....	8	8	16
Constipation	....	....	45	61	106	Indigestion:					
Coryza	....	....	17	15	32	Gastric	....	....	18	35	53
Cystitis	....	....	....	6	6	Intestinal	....	....	45	30	75
						Influenza	2	....	40	24	66

Medical and surgical diseases—out-patient department—Continued.

Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.	
***Medical*—Continued.**					
Lumbago	....	....	15	3	18
Malaria	....	....	5	2	7
Migraine	....	....	2	17	19
Mycsitis	....	....	12	5	17
Myalgia	....	....	22	11	33
Neuralgia:					
Facial	2	....	20	35	57
Sciatic	....	....	4	1	5
Nephritis:					
Acute	....	....	11	3	14
Chronic	....	....	40	17	57
Neurasthenia	....	....	12	18	30
Neuritis	....	....	4	2	6
Parotitis	....	....	4	1	5
Pharyngitis	....	....	11	11	22
Pleurodynia	....	....	15	9	24
Pleurisy	....	....	42	21	63
Pneumonia, lobar	1	....	7	3	11
Pregnancy, hypermesis of	....	....	....	5	5
Rheumatism:					
Acute articular	....	....	17	11	28
Chronic articular	....	....	10	5	15
Muscular	....	....	65	42	107
Sciatic	....	....	11	2	13
Syphilis, tertiary	....	....	7	5	12
Tracheitis	....	....	4	7	11
Tuberculosis, incipient	....	....	15	7	22
Typhoid fever	....	....	3	1	4
Undiagnosed	....	....	45	61	106
Total	10	3	959	809	1,781
Revisits	....	....	....	....	3,804
Minor surgery.					
Abscess:					
Hand	....	....	6	2	8
Neck	....	....	3	....	3
Scalp	....	....	4	....	4
Submental	....	....	5	....	5
Cellulitis:					
Arm	....	....	4	1	5
Neck	....	....	3	....	3
Dislocations:					
Shoulder	....	....	2	1	3
Wrist	....	....	1	....	1
Fibroma:					
Arm	....	....	3	2	5
Scalp	....	....	4	1	5
Fistula in ano	....	....	5	1	6
Foreign body:					
Eye	....	....	6	2	8
Hand	....	....	....	3	3
Lipoma	....	....	5	3	8
Papilloma of eye	....	....	3	....	3
Phimosis	....	....	10	....	10
Varicose veins	....	....	....	2	2
Vaccinations	....	....	82	110	192
Total	....	....	146	128	274
Surgical dressings	....	....	....	....	2,609
Orthopedic.					
Ankylosis:					
Elbow	....	....	....	1	1
Hip	....	....	2	....	2
Arthritis:					
Gonorrheal	....	....	4	4	8
Hypertrophic	....	....	....	1	1
Infectious	....	....	4	1	5
Villous	....	....	1	2	3
Bursitis, subacromial	....	....	6	....	6
Dislocations:					
Semilunar cartilage	....	....	1	1	2
Shoulder	....	....	2	1	3

Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.	
***Orthopedic*—Continued.**					
Fracture:					
Colles's	....	....	2	2	4
Foot	....	....	2	....	2
Femur	....	....	1	....	1
Genu valgum	....	....	1	1	2
Genu varum	....	....	2	1	3
Infantile paralysis	....	....	....	1	1
Osteomyelitis	....	....	1	1	2
Periostitis	....	....	1	1	2
Pes planus	....	....	5	17	22
Sacro-iliac relaxation	....	....	12	5	17
Scoliosis	....	....	2	2	4
Sprains of joints	....	....	10	5	15
Synovitis	....	....	3	2	5
Tuberculosis:					
Ankle	....	....	....	2	2
Hip	....	....	....	1	1
Knee	....	....	5	1	6
Spine	....	....	3	2	5
Wrist	....	....	1	....	1
Undiagnosed	....	....	17	7	24
Total	....	....	88	62	150
Revisits	....	....	....	....	512
Dermatology.					
Abrasions	....	....	2	....	2
Acne	....	....	18	9	27
Acne vulgaris	....	....	26	8	34
Adenitis, cervical	....	....	....	2	2
Alopecia areata	....	....	4	....	4
Chancroid	....	....	....	5	5
Condylomata, luetic	....	....	1	3	4
Dermatitis:					
Calinca	....	....	1	....	1
Medicamenta	....	....	6	4	10
Venenata	3	....	3	4	10
Ecthyma	....	....	1	....	1
Eczema	....	....	31	38	69
Erythema	....	....	1	2	3
Furuncle	....	....	4	2	6
Herpes	2	....	3	2	7
Icthyosis	....	....	....	1	1
Impetigo	....	....	1	2	3
Impetigo contagioso	2	1	5	3	11
Keloid	....	....	4	....	4
Keratosis, palmar	....	....	3	....	3
Leucoderma	....	....	....	1	1
Measles	....	....	1	1	2
Papilloma	....	....	2	5	7
Pediculosis	1	....	1	....	2
Pomphalys	....	....	1	....	1
Pityruasis	....	....	4	2	6
Psoriasis	1	....	3	1	5
Scabies	....	....	15	4	19
Scarlatina	....	....	....	1	1
Seborrhea	....	....	6	8	14
Syphilis:					
Secondary	....	....	27	33	60
Tertiary	....	....	5	1	6
Sycosis, vulgaris	....	....	2	....	2
Tinea:					
Circinata	....	....	8	2	10
Tonsurans	....	....	18	....	18
Versicolor	....	....	2	....	2
Varicella	....	....	2	1	3
Verruca	....	....	4	7	11
Vitiligo	....	....	1	....	1
Ulcer	....	....	4	3	7
Urticaria	....	1	8	5	14
Undiagnosed	....	....	11	7	18
Total	9	2	239	167	417
Revisits	....	....	....	....	375

Occupation, except pay patients.

Occupations.	White.		Colored.		Occupations.	White.		Colored.	
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.
Agent	....	....	2	.....	Matron	....	....	.....	1
Baker	1	....	1	.....	Mechanic	....	....	4	.....
Barber	....	....	20	.....	Merchant	1	....	.....	.....
Bartender	....	....	1	.....	Messenger	1	....	13	.....
Bellman	....	....	9	.....	Milliner	....	1	.....	.....
Blacksmith	....	....	3	.....	Miner	....	....	5	.....
Bootblack	....	....	2	.....	Minister	....	....	5	.....
Bricklayer	2	....	3	.....	Missionary	....	....	1	.....
Butcher	....	....	3	.....	Musician	....	....	2	.....
Butler	....	....	6	.....	No occupation	5	1	309	321
Carpenter	4	....	8	.....	Nursemaid	....	....	.....	48
Chauffeur	....	....	11	.....	Orderly	....	....	8	.....
Clerk	4	....	7	.....	Painter	4	....	5	.....
Coachman	....	....	2	.....	Paper hanger	....	....	1	.....
Cook	....	....	20	81	Physician	....	....	3	.....
Domestic	....	2	.....	821	Plasterer	1	....	4	.....
Dressmaker	....	1	.....	25	Plumber	....	....	2	.....
Driver	2	....	20	.....	Policeman	2	....	.....	.....
Druggist	1	....	.....	.....	Porter	....	....	34	.....
Elevator man	....	....	8	.....	Printer	....	....	1	.....
Engineer	3	....	1	.....	Sailor	....	....	2	.....
Expressman	1	....	3	.....	Salesman	....	....	3	.....
Farmer	....	....	61	.....	Shoemaker	....	....	2	.....
Fireman	....	....	6	.....	Soldier	5	....	3	.....
Fisherman	....	....	4	.....	Student	4	....	162	62
Gardener	....	....	2	.....	Trained nurse	....	....	.....	3
Hairdresser	....	....	.....	3	Teacher	....	....	5	11
Hostler	....	....	1	.....	Tinner	....	....	1	.....
Housekeeper	....	2	.....	95	Undertaker	....	....	2	.....
Housewife	....	2	.....	104	Upholsterer	....	....	2	.....
Huckster	....	....	14	.....	Valet	....	....	1	.....
Janitor	....	....	17	.....	Waiter	....	....	35	6
Jockey	....	....	1	.....	Watchman	2	....	7	.....
Laborer	6	....	445	.....					
Laundress	....	....	.....	116	Total	51	9	1,306	1,697
Machinist	2	....	3	.....					

OUTDOOR SERVICE.

The following tables show the number of medical and surgical diseases treated in the outdoor service:

Medical and surgical diseases—out-patient department.

Diagnosis.	White.		Colored.		Total.	Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.			Male.	Female.	Male.	Female.	
Medical.						*Medical*—Continued.					
Adenitis	....	....	15	8	23	Debility	1	....	5	3	9
Alcoholism	....	....	14	5	19	Debility, senile	....	....	12	2	14
Anemia	....	....	15	25	40	Dyspepsia	....	....	5	12	17
Aneurism	....	....	4	1	5	Diarrhea	....	....	20	21	41
Aortic regurgitation	....	....	15	8	23	Empyema	....	....	1	....	1
Arthritis, infectious	....	....	18	6	24	Febricula	....	....	2	3	5
Arteriosclerosis	....	....	21	11	32	Gastritis:					
Asthma, bronchial	....	....	14	7	21	Acute	....	....	18	7	25
Autointoxication, intestinal	....	....	27	11	38	Chronic	....	....	25	11	36
Bronchitis:						Gastric stasis	....	....	4	7	11
Acute	4	3	65	115	187	Gastric ulcer	....	....	6	3	9
Chronic	....	....	45	25	70	Hemorrhoids	....	....	28	18	46
Cardiac hypertrophy	....	....	4	1	5	Hysteria	....	....	....	10	10
Chorea	....	....	....	5	5	Ileocolitis	....	....	8	8	16
Constipation	....	....	45	61	106	Indigestion:					
Coryza	....	....	17	15	32	Gastric	....	....	18	35	53
Cystitis	....	....	....	6	6	Intestinal	....	....	45	30	75
						Influenza	2	....	40	24	66

Medical and surgical diseases—out-patient department—Continued.

Diagnosis.	White.		Colored.		
	Male.	Female.	Male.	Female.	Total.
Medical—Continued.					
Lumbago			15	3	18
Malaria			5	2	7
Migraine			2	17	19
Myositis			12	5	17
Myalgia			22	11	33
Neuralgia:					
Facial	2		20	35	57
Sciatic			4	1	5
Nephritis:					
Acute			11	3	14
Chronic			40	17	57
Neurasthenia			12	18	30
Neuritis			4	2	6
Parotitis			4	1	5
Pharyngitis			11	11	22
Pleurodynia			15	9	24
Pleurisy			42	21	63
Pneumonia, lobar	1		7	3	11
Pregnancy, hypermesis of				5	5
Rheumatism:					
Acute articular			17	11	28
Chronic articular			10	5	15
Muscular			65	42	107
Sciatic			11	2	13
Syphilis, tertiary			7	5	12
Tracheitis			4	7	11
Tuberculosis, incipient			15	7	22
Typhoid fever			3	1	4
Undiagnosed			45	61	106
Total	10	3	959	809	1,781
Revisits					3,804
Minor surgery.					
Abscess:					
Hand			6	2	8
Neck			3		3
Scalp			4		4
Submental			5		5
Cellulitis:					
Arm			4	1	5
Neck			3		3
Dislocations:					
Shoulder			2	1	3
Wrist			1		1
Fibroma:					
Arm			3	2	5
Scalp			4	1	5
Fistula in ano			5	1	6
Foreign body:					
Eye			6	2	8
Hand				3	3
Lipoma			5	3	8
Papilloma of eye			3		3
Phimosis			10		10
Varicose veins				2	2
Vaccinations			82	110	192
Total			146	128	274
Surgical dressings					2,609
Orthopedic.					
Ankylosis:					
Elbow				1	1
Hip			2		2
Arthritis:					
Gonorrheal			4	4	8
Hypertrophic				1	1
Infectious			4	1	5
Villous			1	2	3
Bursitis, subacromial			6		6
Dislocations:					
Semilunar cartilage			1	1	2
Shoulder			2	1	3

Diagnosis.	White.		Colored.		
	Male.	Female.	Male.	Female.	Total.
Orthopedic—Continued.					
Fracture:					
Colles's			2	2	4
Foot			2		2
Femur			1		1
Genu valgum			1	1	2
Genu varum			2	1	3
Infantile paralysis				1	1
Osteomyelitis			1	1	2
Periostitis			1	1	2
Pes planus			5	17	22
Sacro-iliac relaxation			12	5	17
Scoliosis			2	2	4
Sprains of joints			10	5	15
Synovitis			3	2	5
Tuberculosis:					
Ankle				2	2
Hip				1	1
Knee			5	1	6
Spine			3	2	5
Wrist			1		1
Undiagnosed			17	7	24
Total			88	62	150
Revisits					512
Dermatology.					
Abrasions			2		2
Acne			18	9	27
Acne vulgaris			26	8	34
Adenitis, cervical				2	2
Alopecia areata			4		4
Chancroid				5	5
Condylomata, luetic			1	3	4
Dermatitis:					
Calinca			1		1
Medicamenta			6	4	10
Venenata	3		3	4	10
Ecthyma			1		1
Eczema			31	38	69
Erythema			1	2	3
Furuncle			4	2	6
Herpes	2		3	2	7
Ichthyosis				1	1
Impetigo			1	2	3
Impetigo contagiosa	2	1	5	3	11
Keloid			4		4
Keratosis, palmar			3		3
Leucoderma				1	1
Measles			1	1	2
Papilloma			2	5	7
Pediculosis	1		1		2
Pomphalyx			1		1
Pityriasis			4	2	6
Psoriasis	1		3	1	5
Scabies			15	4	19
Scarlatina				1	1
Seborrhea			6	8	14
Syphilis:					
Secondary			27	33	60
Tertiary			5	1	6
Sycosis, vulgaris			2		2
Tinea:					
Circinata			8	2	10
Tonsurans			18		18
Versicolor			2		2
Varicella			2	1	3
Verruca			4	7	11
Vitiligo			1		1
Ulcer			4	3	7
Urticaria		1	8	5	14
Undiagnosed			11	7	18
Total	9	2	239	167	417
Revisits					375

Statistical summary, all patients.

	1915					1914				
	White.		Colored.			White.		Colored.		
	Male.	Female.	Male.	Female.	Total.	Male.	Female.	Male.	Female.	Total.
In hospital July 1, 1914:										
Pay patients	....	....	.....	.....	.....	....	....	2	4	6
Indigent, United States	....	....	.....	.....	.....	....	1	40	55	96
Indigent, District of Columbia	....	....	.....	.....	.....	....	....	34	51	85
Total	....	....	.....	.....	.....	....	1	76	110	187
Admitted:										
Pay patients	2	2	85	168	257	3	2	68	134	207
Pay patients, births	....	....	13	15	28	....	....	14	7	21
Indigent, United States	21	6	560	680	1,267	12	3	504	613	1,132
Indigent, District of Columbia	29	3	622	863	1,517	33	4	611	856	1,504
Indigent, births, United States	....	....	56	68	124	....	....	55	60	115
Indigent, births, District of Columbia	1	....	68	86	155	....	....	82	83	165
Total admitted	53	11	1,404	1,880	3,348	48	9	1,334	1,753	3,144
Total under care, indoor	53	12	1,480	1,990	3,535	50	9	1,406	1,870	3,335
Stillbirths:										
Pay patients	....	....	3	.....	3	1	....	2	.....	3
Indigent	....	....	15	13	28	....	....	20	19	39
Total	....	....	18	13	31	1	....	22	19	42
Deaths:										
Pay patients	....	1	7	11	19	....	....	8	8	16
Indigent	2	....	139	96	237	....	....	152	108	260
Total	2	1	146	107	256	....	....	160	116	276
Discharged, including births:										
Pay patients—										
Recovered	....	....	.....	.....	152	....	....	.....	.....	126
Improved	....	....	.....	.....	94	....	....	.....	.....	74
Unimproved	....	....	.....	.....	11	....	....	.....	.....	8
Total	....	....	.....	.....	257	....	....	.....	.....	218
Indigent—										
Recovered	....	....	.....	.....	1,407	....	....	.....	.....	1,266
Improved	....	....	.....	.....	1,173	....	....	.....	.....	1,057
Unimproved	....	....	.....	.....	250	....	....	.....	.....	215
Not treated	....	....	.....	.....	11	....	....	.....	.....	6
Total	....	....	.....	.....	2,841	....	....	.....	.....	2,654
Grand total discharged	....	....	.....	.....	3,354	....	....	.....	.....	3,148
In hospital July 1, 1915:										
Pay patients	....	....	5	10	15	....	....	2	4	6
Indigent, United States	2	1	38	61	102	....	1	40	55	96
Indigent, District of Columbia	1	1	22	40	64	....	....	34	51	85
Total indigent	3	2	60	101	166	....	1	74	106	181
Grand total remaining	3	2	65	111	181	....	1	76	110	187
Operations	109	17	1,118	1,052	2,296	15	7	816	955	1,793
Results of operations:										
Recovered	....	....	.....	.....	978	....	....	.....	.....	741
Improved	....	....	.....	.....	1,261	....	....	.....	.....	976
Unimproved	....	....	.....	.....	8	....	....	.....	.....	16
Died	....	....	.....	.....	49	....	....	.....	.....	69
Total	....	....	.....	.....	2,296	....	....	.....	.....	1,793
Emergencies:										
District of Columbia and United States	....	....	.....	.....	.....	....	....	.....	.....	.....
Total	80	8	403	244	744	43	11	523	199	775

Medical and surgical diseases—out-patient department—Continued.

Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.	
Ear, nose, and throat—Con.					
Foreign body:					
Ear	....	....	5	2	7
Nose	....	....	....	....	2
Throat	....	....	1	4	5
Gumma palate	....	....	1	....	1
Lacerations, mouth	....	....	3	....	3
Laryngitis:					
Acute	....	....	15	11	26
Chronic	....	....	10	13	23
Specific	....	....	1	3	4
Nasopharyngitis	....	1	9	7	17
Nasal septum, deflection of	....	....	2	5	7
Otalgia	....	....	3	4	7
Otitis externa	....	....	4	....	4
Otitis media:					
Acute	....	....	15	9	24
Chronic	....	....	9	3	12
Pharyngitis:					
Acute	....	....	21	35	46
Chronic	....	....	30	37	67
Specific	....	....	5	2	7
Rhinitis:					
Acute	....	....	5	7	12
Atrophic	....	....	7	3	10
Hypertrophic	....	....	7	12	19
Sinusitis	....	....	3	1	4
Tonsils, hypertrophy of:					
Faucial	....	....	54	65	119
Lingual	....	....	8	4	12
Tonsillitis:					
Acute	....	....	48	41	89
Chronic	....	....	8	9	17
Follicular	....	....	10	9	19
Specific	....	....	4	4	8
Tracheitis	....	....	1	1	2
Turbinate bones, hypertrophy of	....	....	15	8	23
Ulcers:					
Nasal septum	....	....	2	1	3
Tongue	....	....	4	7	11
Uvula	....	....	2	....	2
Undiagnosed	....	....	19	21	40
Total	3	3	404	401	811
Revisits	....	....	....	....	1,710

Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.	
Neurology.					
Arteriosclerosis	....	....	3	1	4
Arteritis, syphilitic	2	....	5	....	7
Cerebral hemorrhage	....	....	4	2	6
Epilepsy	....	....	8	5	13
Hemiplegia	....	....	9	2	11
Hypertension, arterial	....	....	4	3	7
Hyperthyroidism	....	....	....	2	2
Hysteria	....	....	1	7	8
Neuralgia, trigeminal	....	....	9	11	20
Neurasthenia	....	....	7	5	12
Neuritis	....	....	3	3	6
Polyneuritis	....	....	5	1	6
Sciatica	....	....	4	1	5
Spinal sclerosis	....	....	7	2	9
Tabes dorsalis	....	....	5	1	6
Undiagnosed	....	....	15	5	20
Total	2	....	89	51	142
Revisits	....	....	....	....	302
Genitourinary.					
Abscess, perineal	....	....	1	....	1
Adenitis, inguinal	....	....	38	....	38
Chancre	....	....	12	....	12
Chancroid	....	....	25	....	25
Condylomata	....	....	10	....	10
Epididymitis	....	....	31	....	31
Phimosis	....	....	27	....	27
Prostate, hypertrophy of	....	....	6	....	6
Prostatitis	....	....	5	....	5
Stricture of urethra	....	....	19	....	19
Syphilis, secondary	....	....	26	....	26
Tuberculosis of bladder	....	....	1	....	1
Urethritis:					
Anterior	....	....	147	....	147
Posterior	....	....	130	....	130
Venereal warts	....	....	4	....	4
Total	....	....	482	....	482
Revisits	....	....	....	....	1,403
Tuberculosis.					
Pulmonary tuberculosis	....	....	41	35	76
Total	....	....	41	35	76
Revisits	....	....	....	....	275

Statistical summary, all patients.

	1915					1914				
	White.		Colored.			White.		Colored.		
	Male.	Female.	Male.	Female.	Total.	Male.	Female.	Male.	Female.	Total.
In hospital July 1, 1914:										
Pay patients	....	....	.....	.....	.....	....	....	2	4	6
Indigent, United States	....	....	.....	.....	.....	....	1	40	55	96
Indigent, District of Columbia	....	....	.....	.....	.....	....	....	34	51	85
Total	....	....	.....	.....	.....	....	1	76	110	187
Admitted:										
Pay patients	2	2	85	168	257	3	2	68	134	207
Pay patients, births	....	....	13	15	28	....	....	14	7	21
Indigent, United States	21	6	560	680	1,267	12	3	504	613	1,132
Indigent, District of Columbia	29	3	622	863	1,517	33	4	611	856	1,504
Indigent, births, United States	....	....	56	68	124	....	....	55	60	115
Indigent, births, District of Columbia	1	....	68	86	155	....	....	82	83	165
Total admitted	53	11	1,404	1,880	3,348	48	9	1,334	1,753	3,144
Total under care, indoor	53	12	1,480	1,990	3,535	50	9	1,406	1,870	3,335
Stillbirths:										
Pay patients	....	....	3	.....	3	1	....	2	.....	3
Indigent	....	....	15	13	28	....	....	20	19	39
Total	....	....	18	13	31	1	....	22	19	42
Deaths:										
Pay patients	....	1	7	11	19	....	....	8	8	16
Indigent	2	....	139	96	237	....	....	152	108	260
Total	2	1	146	107	256	....	....	160	116	276
Discharged, including births:										
Pay patients—										
Recovered	....	....	.....	.....	152	....	....	.....	.....	126
Improved	....	....	.....	.....	94	....	....	.....	.....	74
Unimproved	....	....	.....	.....	11	....	....	.....	.....	8
Total	....	....	.....	.....	257	....	....	.....	.....	218
Indigent—										
Recovered	....	....	.....	.....	1,407	....	....	.....	.....	1,266
Improved	....	....	.....	.....	1,173	....	....	.....	.....	1,087
Unimproved	....	....	.....	.....	250	....	....	.....	.....	215
Not treated	....	....	.....	.....	11	....	....	.....	.....	6
Total	....	....	.....	.....	2,841	....	....	.....	.....	2,654
Grand total discharged	....	....	.....	.....	3,354	....	....	.....	.....	3,148
In hospital July 1, 1915:										
Pay patients	....	....	5	10	15	....	....	2	4	6
Indigent, United States	2	1	38	61	102	....	1	40	55	96
Indigent, District of Columbia	1	1	22	40	64	....	....	34	51	85
Total indigent	3	2	60	101	166	....	1	74	106	181
Grand total remaining	3	2	65	111	181	....	1	76	110	187
Operations	109	17	1,118	1,052	2,296	15	7	816	955	1,793
Results of operations:										
Recovered	....	....	.....	.....	978	....	....	.....	.....	741
Improved	....	....	.....	.....	1,261	....	....	.....	.....	976
Unimproved	....	....	.....	.....	8	....	....	.....	.....	16
Died	....	....	.....	.....	49	....	....	.....	.....	69
Total	....	....	.....	.....	2,296	....	....	.....	.....	1,793
Emergencies:										
District of Columbia and United States	....	....	.....	.....	.....	....	....	.....	.....	.....
Total	89	8	403	244	744	43	11	523	189	775

Statistical summary, all patients—Continued.

	1915					1914				
	White.		Colored.			White.		Colored.		
	Male.	Female.	Male.	Female.	Total.	Male.	Female.	Male.	Female.	Total.
Outpatients:										
Medical	10	3	959	809	1,781	11	3	858	756	1,628
Minor surgical	....	....	146	128	274	....	....	185	156	341
Gynecological	....	....	416	416	....	....	....	....	693	693
Neurological	2	....	89	51	142	2	....	87	85	174
Eye	....	....	391	532	923	3	3	439	612	1,057
Ear, nose, and throat	3	3	404	401	811	6	5	526	520	1,057
Genito-urinary	....	....	482	....	482	....	....	541	....	541
Pediatrical	4	3	177	218	402	2	1	142	151	296
Dermatological	9	2	239	167	417	10	3	187	195	395
Orthopedic	....	....	88	62	150	....	1	106	73	180
Tuberculosis	....	....	41	35	76	....	....	31	22	52
Total	28	11	3,016	2,819	5,874	34	16	3,102	3,263	6,415
Surgical dressings	....	....	....	....	2,609	....	....	185	156	341
Revisits	....	....	....	....	15,185	....	....	....	....	8,606
Days maintenance:										
Pay patients	....	....	....	....	4,247	....	....	....	....	3,581
Indigent, United States	....	....	....	....	38,981	....	....	....	....	33,642
Indigent, District of Columbia	....	....	....	....	35,005	....	....	....	....	34,072
Officers and employees	....	....	....	....	38,338	....	....	....	....	36,089
Total	....	....	....	....	116,571	....	....	....	....	107,384
Cost of patients per day, based on gross expense	....	....	....	....	$1.289	....	....	....	....	$0.924
Largest number of indigent patients at any one time	....	....	....	....	244	....	....	....	....	221
Smallest number of indigent patients at any one time	....	....	....	....	166	....	....	....	....	146
Daily average number of patients, indigent and pay	....	....	....	....	214.3	....	....	....	....	195.3
Number admitted from District of Columbia, including births, indigent	....	....	....	....	1,674	....	....	....	....	1,669
Number admitted from United States, including births, indigent	....	....	....	....	1,389	....	....	....	....	1,247
Number of prescriptions compounded in and outdoor	....	....	....	....	44,340	....	....	....	....	36,502

FINANCIAL STATEMENTS.

BOARD OF CHARITIES ACCOUNT.

July 1, 1914, to June 30, 1915.

	Adults.	Children.	Babies.	Total.
In hospital July 1, 1914	71	11	3	85
Admitted	1,312	208	154	1,674
Total	1,383	219	157	1,759

Appropriation	$35,000.00
Bills rendered	34,965.35
Unearned balance	34.65

ALLOTMENT OF APPROPRIATION FOR SALARIES.

[Under requirement of act of Congress approved June 25, 1909 (35 Stat., 992).]

	Per annum.		Per annum.
Surgeon in chief	$3,000	Seamstress	$300
Assistant surgeon	1,500	Nurses (48 at $60)	2,880
Resident physician	1,200	Orderlies (2 at $300)	600
Pathologist	2,000	Orderlies (4 at $240)	960
Anæsthetist	1,200	Night orderly	276
Clerk	1,400	Maids (3 at $168)	504
Assistant clerk (1)	700	Head cook	540
Assistant clerk (1)	636	Second cook	360
Pharmacist	720	Third cook	288
Assistant pharmacist	120	Waiters (3 at $156)	468
Steward	720	Driver	408
Superintendent of nurses	1,080	Driver	360
Assistant superintendent of nurses	600	Laundryman	420
Night supervisor of nurses	480	Laundresses (5 at $156)	780
Head nurses (2 at $480)	960	Watchman	240
Engineer	1,200	Watchman	204
Assistant engineer	1,000	Laborer	216
Assistant engineer	900	Laborers (2 at $180)	360
Plumber	900		
Firemen (3 at $720)	2,160	Total	32,640

RECEIPTS AND DISBURSEMENTS.

RECEIPTS.

Appropriation, sundry civil act:		
For support	$28,000.00	
Salaries	32,640.00	
Painting, special repairs, improvements, etc	6,000.00	
		$66,640.00
Appropriation, District of Columbia (under contract with Board of Charities)	34,965.35	
Pay patients	5,750.10	
		40,715.45
Total		107,355.45

DISBURSEMENTS.

Miscellaneous:		
Fuel, light, clothing, forage, medicine, etc	$33,862.03	
Painting, special repairs, improvements, etc	5,999.42	
Pay patient	3,056.16	
Subsistence	28,581.50	
Pay patients	412.04	
Salaries	32,619.17	
Pay patients	2,040.00	
Refunds, pay patients	218.70	
		106,789.02
		566.43

Miscellaneous expenditures.

Class No.		1915	1914
1	Stationery and drafting supplies	$338.15	$244.71
2	Hardware, metals, cordage, leather and saddlery:		
	Hardware	485.09	408.18
	Metals	37.32	10.67
	Cordage	1.01	.....
	Leather and saddlery	.84	5.24
3	Dry goods and wearing apparel	2,967.50	3,107.46
4	Drugs and medicines, chemicals and reagents	2,772.14	2,809.33
	Wines and whisky	102.43	165.22
5	Laboratory, hospital appliances, surgical instruments, etc.:		
	Laboratory	221.60	204.88
	Hospital appliances	3,529.06	3,143.07
	Surgical instruments	196.95	402.79
6	Electrical, engineering, and plumbing supplies:		
	Electrical	120.11	336.13
	Plumbing	543.32	812.00
7	Lumber, millwork, and building material	183.24	139.55
8	Paints, oils, and brushes:		
	Paints	66.75	90.36
	Oils	212.27	345.33
	Brushes	67.84	54.00
9	Furniture and floor covering:		
	Furniture	141.90	133.73
	Floor covering	110.60	84.65
10	Household supplies:		
	Cleaning	196.80	342.27
	Laundry	982.88	901.95
	Miscellaneous	864.37	557.56
11	Forage and seed:		
	Forage	$382.57	$395.18
	Seed	1.94	.....
12	Photographic supplies	374.15	97.33
14	Fuel:		
	Charcoal	15.75	13.28
	Coal, anthracite	264.00	192.00
	Coal, bituminous	11,503.00	11,617.35
	Coke	2.00	.....
	Wood	62.00	74.25
15	Incandescent electric lamps	92.24	216.22
	Heat, light, and power service:		
	Gas	63.94	748.34
	Hauling ashes	478.55	412.40
	Telephone service	441.79	417.67
	Lamp posts and globes	99.96	.....
17	Ambulance chassis and equipment	2,202.73	.....
	Ambulance body	1,150.00	.....
	Books and periodicals	64.75	93.25
	Sundries (unclassified miscellaneous)	775.00	186.85
	Repairs and construction:		
	Repairs—		
	Buildings	599.30	1,509.47
	Furniture	34.50	18.50
	Grounds	12.00	699.26
	Heating system	37.44	67.35
	Instruments	255.46	213.90
	Kitchen utensils	91.40	330.75
	Laboratory	1.50	.....
	Laundry	5.50	32.50
	Office	6.48	.....
	Power plant	118.00	200.60
	Stable	65.60	54.05
	Miscellaneous	364.56	71 31
	Construction	63.75	178.73
	Total	33,862.03	32,312.02

Subsistence expenditures.

Class No.		1915	1914	Class No.		1915	1914
10	Beverages:				Fowl:		
	Coffee	$327.75	$365.05		Chicken	$1,838.90	$2,298.77
	Chocolate	21.00	34.08		Turkey	55.00	112.70
	Cocoa	47.75	42.69		Fruits and nuts	965.04	1,097.71
	Tea	139.18	202.44		Fruits, dried	502.22	318.71
	Canned goods	1,154.27	1,031.19	14	Ice	558.68	874.67
	Condiments and flavors	173.43	115.17	10	Lard, pure hog	334.23	262.08
	Cereal food products:				Meats:		
	Cornstarch	6.81	10.55		Bacon—		
	Barley	7.69	5.27		Breakfast	577.49	583.57
	Buckwheat	1.63	4.69		Shoulder	480.17	398.22
	Bread	1,825.12	1,604.80		Beef—		
	Crackers and cakes	263.80	249.98		Fresh	2,860.47	2,314.84
	Cream of wheat	51.21	51.59		Corned	193.18	183.59
	Flakes, corn	72.12	48.30		Dried	190.40	43.32
11	Flour	287.98	199.36		Tongue	307.20	339.15
10	Hominy, coarse	8.54	5.26		Bologna	38.54	8.12
	Hominy grits	16.38	8.26		Ham, smoked	549.16	588.48
	Macaroni	15.78	16.90		Lamb	74.46	.....
	Meal, corn	46.37	33.92		Liver	210.82	162.04
	Oats, rolled	28.17	15.18		Mincemeat	2.79	2.19
	Rice	73.56	64.80		Mutton	906.33	1,320.80
	Tapioca	4.08	4.39		Pork, fresh	255.93	195.72
	Spaghetti	13.53	16.79		Sausage—		
	Unclassified	528.40	460.74		Smoked	114.81	118.54
	Dairy products:				Green	30.68	39.99
	Butter	3,158.19	2,460.52		Veal	221.30	197.39
	Buttermilk	100.00	48.65	10	Saccharine products:		
	Cream	46.20	45.12		Molasses	6.72	5.50
	Cheese	35.20	40.24		Sugar—		
	Milk, fresh	3,202.32	2,893.49		Granulated	1,165.05	898.88
	Eggs	1,441.35	1,319.02		Brown	3.13	.....
	Fish:				Powdered	3.49	2.60
	Clam bouillon	69.35	126.54		Sirup	36.80	23.25
	Codfish	116.16	105.48		Salt	18.98	20.25
	Fresh	467.82	441.00		Soft drinks, ginger ale	127.88	38.34
	Herring, smoked	7.98	35.22		Vegetables	2,114.10	2,043.97
	Mackerel, salt	67.14	56.20				
	Oysters	242.75	170.10		Total	28,881.50	26,890.59
	Salmon	68.54	.....				

Receipts and expenditures on account of pay patients.

	1915	1914
Receipts:		
Private room patients, at $1.25 per day	$4,411.25	$3,898.75
Ward patients, at $1.10 per day	558.80	752.50
Children, at 65 cents per day	65.65	57.20
Babies, at 40 cents per day	148.40	98.40
Operations	505.00	789.00
X-ray photos	38.00	11.00
Use of delivery room	25.00	.....
	5,750.10	5,307.85
Expenditures:		
Extra services (nurses, orderlies, maids)	2,040.00	1,570.17
Subsistence	412.04	95.58
Medical and surgical supplies	924.19	2,472.55
Miscellaneous (dry goods, painting, repairs)	2,130.62	850.41
Refund of overpayments by patients	218.70	214.25
	5,725.55	5,211.86
Unexpended balance	24.55	95.99

NEEDS.

First and foremost is a pathological building, which has been mentioned in former annual reports, and its importance makes it imperative that it should be kept constantly in mind. No hospital can render full measure of professional service to its inmates without the aid of proper facilities for a complete scientific investigation of their ailments, and it is hoped that Congress will make adequate provision for this much-needed building.

It would also add much to the public service if a ward for the eye and nervous patients could be had. The present buildings do not afford sufficient space to properly classify these cases. They are, therefore, scattered through the different wards, rendering efficient treatment difficult. A ward of about 25 beds would be sufficient to care for this need.

Among the needed employees none are more urgent than a storekeeper, an assistant anesthetist, and assistant engineer.

The nursing force is much too small. It is indeed surprising that so few complaints arise from this side of the service, with provision for only 52 nurses, and the hospital carrying 278 beds. This force should be increased, not only to permit more nursing for each patient, but to reduce the hours of labor to an eight-hour basis. To do this, however, would require an appropriation sufficient to enlarge the nurses' home, but the benefits derived therefrom by both patient and nurse would more than justify the cost.

The grounds surrounding the hospital should be beautified and fenced, thus adding to its usefulness as well as to the attractiveness of the entire institution.

PROPERTY OF DECEASED PATIENTS.

The hospital holds about $160 left by deceased patients. All efforts to locate their heirs or legal representatives have been fruitless. It is recommended that action be taken looking to the enactment of appropriate legislation by Congress authorizing disposition of this money.

TRAINING SCHOOL FOR NURSES.

Two hundred and sixty-three young women have graduated from the school during the 21 years of its existence. Appointments to the school are made with great care. Only 6 per cent of those applying for admission since the beginning of the school succeeded in entering probation. Fifty per cent of those received on probation failed to remain, and 30 per cent of those who were accepted after the probationary period failed to reach graduation—a true instance where many are called but few chosen.

Graduates of 1915.

Mary Jane Sheppherd, private nurse, Meyersdale, Pa.
Marion Hilda Brown, private nurse, Washington, D. C.
Helen Clotilda Johnson, Pennsylvania.
Katherine Zada Benson, Maryland.
Christie Elaine Owens, North Carolina.
Caroline Beatrice Lovett, Pennsylvania.
Alice Ellen Martin, Alabama.
Pearl Mabel Spurlock, Pennsylvania.

Lectures.

The course of lectures was delivered by the following staff:

Gynecology	J. E. H. Taylor, M. D.
Anatomy and physiology	S. L. Carson, M. D.
Hygiene	C. A. Brooks, M. D.
Theoretical nursing	Laura R. MacHale.
Dietetics, practical and theoretical nursing	Emma M. Irwin.
Diseases of the eye	M. O. Dumas, M. D.
Medical nursing	Caryl Burbank, M. D.
Diseases of children	Wm. French, M. D.
Obstetrics	E. D. Williston, M. D.
Materia medica and therapeutics	John W. Mitchell, M. D.
Urinalysis and bacteriology	W. Van Swearingen, M. D.
Neurology	E. C. A. Wilson, M. D.
Ear, nose, and throat	Reginald Walker M. D.
Surgical nursing	Wm. A. Jack, M. D.

Applications, resignations, dismissals, etc.

Applications received during the year	131
Applicants taken on probation	14
Accepted after probation	10
Resigned	3
Withdrawn during probation	1
On probation	3

Nursing staff.

Superintendent of nurses	1
Assistant superintendent of nurses	1
Graduate head nurses	3
Night supervisor of nurses	1
Graduate of class 1914 still in hospital	4
Senior pupil nurses	9
Intermediate pupil nurses	14
Junior pupil nurses	3
Probationers	14

Textbooks used.

Anatomy and Physiology—Kimber's.
Materia Medica—Foot's.
Theory and Practice of Nursing—Hampton.
Gynecology—McFarland.
Fever Nursing—Paul.
Obstetrics—De Lee.
Care of Feeding of Children—Holt.
Nurses are required to furnish their own books.

Course of instruction.

First year:
- Ethics—Five lectures.
- Anatomy—Six lectures, one hour each.
- Physiology—Eight lectures, one hour each.
- Hygiene—Four lectures, one hour each.
- Bandaging—Two lectures, one hour each.
- Practical and theoretical nursing—One lecture a week, one hour each, from October 1 to May 1.

Second year:
- Materia medica—Six lectures, one hour each.
- Bacteriology and urinalysis—Five lectures, one hour each.
- Medical nursing, including the acute infectious diseases—Five lectures, one hour each.
- Surgical nursing, including anæsthetics—Eight lectures, one hour each.
- Dietetics—Ten lectures, one hour each.
- Practical and theoretical nursing—One lecture a week, one hour each, from October 1 to May 1.

Third year:

Obstetrics—Six lectures, one hour each.
Children's diseases, including the feeding of infants—Four lectures, one hour each.
Diseases of the eye—Three lectures, one hour each.
Diseases of the ear, nose, and throat—Four lectures, one hour each.
Gynecology—Six lectures, one hour each.
Nervous diseases—Seven lectures, one hour each.
Practical and theoretical nursing—One lecture a week, one hour each, from October 1 to May 1.

First-year practical demonstrations.

[Each lesson one and one-half hours long.]

October:

First lesson—Bedmaking; management of helpless patients—moving, changing, giving baths.
Second lesson—Note taking; pulse, temperature, respiration, mental condition.
Third lesson—The temperature; the thermometer, its use and care; excretions; eruptions.
Fourth lesson—Pulse; quality, rhythm, number, etc.; hypodermic syringe, its care and use.

November:

Fifth lesson—Fomentations; poultices; sand bags; ice cap, its care; ice coil.
Sixth lesson—The hot-water bag or bottle, use and abuse; care of instruments, sterilizing, etc.; care of rubber gloves, methods of sterilizing.
Seventh lesson—Administering of enemata, douches, cantharides, etc.; Murphy infusion.
Eighth lesson—Counterirritations, mustard, cantharides, etc.; physiological action; dry cupping.
Ninth lesson—Hypodermoclysis; intravenous or infusion; preparation of solution; patient, instruments.

December:

Tenth lesson—Positions: Dorsal, Sims, Trendelenberg, Fowler's knee and chest; lithotomy.
Eleventh lesson—Prevention and treatment of bedsores.
Twelfth lesson—Weights and measures, solutions.
Thirteenth lesson—Disinfection of clothing, excreta, sputum, etc.

January:

Fourteenth lesson—Bandages, making and use; material, Esmark.
Fifteenth lesson—Care of patient before, during, and after anesthesia.
Sixteenth lesson—Care of patient before, during, and after operation, and preparation of patient for operation.
Seventeenth lesson—Preparation of room for operation, sterilization, etc.

February:

Eighteenth lesson—Urine analysis, specific gravity, quantity reaction, Fehling's and Heller's tests.
Nineteenth lesson—Contagious-disease nursing, care of convalescents, feeding in particular.
Twentieth lesson—Infant feeding, sterilization, pasteurizing, child's first bath, care of eyes, buttocks, etc.
Twenty-first lesson—Administration of drugs, use and effect.

March:

Twenty-second lesson—Care of the dead.
Twenty-third lesson—Fumigation.

Course in cooking, theoretical and practical

	THEORY.	PRACTICAL WORK.
1.	Water food	Coffee, tea, barley water, lemonade.
2.	Carbohydrates—starch	Gruels, toast, Zwieback.
3.	Carbohydrates—cellulose	Cereals and vegetables.
4.	Carbohydrates—sugar	Fruits, sirups, jelly.
5.	Fats and oils—salads	Salads, salad dressing, butter, cream.
6.	Proteids—milk	Pasteurized, peptonized, koumiss.
7.	Proteids—eggs	Cooked in shell, poached, omelets.
8.	Proteids—milk and eggs	Custards, eggnogs, egg lemonade.
9.	Proteids—meat and fish	Broiling, roasting, meat sandwiches.
10.	Proteids—meat	Beef juice, beef extract. broth.
11.	Proteids—gelatin	Chicken jelly, veal jelly, beef jelly.
12.	Review carbohydrates	Sponge cake, ice cream, water ices.

Three-year schedule.

Ward.	Day duty.	Night duty.
SURGICAL EXPERIENCE.	*Months.*	*Months.*
Male	2	1
Female	2	1
Genito-urinary	1	1
Gynecological	4	2
Orthopedic	1	1
Emergency operating room	1	1
Main operating room	3	.....
Obstetrical	2	1
MEDICAL EXPERIENCE.		
Male	3	1
Female	3	1
Children	2	1
Diet kitchen	1	.....
Total	25	11

Occupation and residence of graduates.

1896.

Ashton, Luci V. (Mrs. Woods), Kansas City, Mo.
Blackburn, N. L., private nurse, Philadelphia, Pa.
Burke, Julia (Mrs. Phillips), Jacksonville, Fla.
Fleetwood, Sara I., deceased.
Foust, Isabella L., private nurse, Winston, N. C.
Gibson, Katherine C., Bureau of Engraving and Printing, Washington, D. C.
Green, Anna N., deceased.
Owens, Laura A., private nurse, Washington, D. C.
Pierce, Letitia (Mrs. Blair), Washington, D. C.
Ricks, Antoinette M. (Mrs. Demby), Kansas City, Mo.
Robinson, Annie B., superintendent and matron, Good Samaritan Hospital, Charlotte, N. C.
Shorter, Sarah A., private nurse, Washington, D. C.
Simms, Annie A. (Mrs. Johnson), Baltimore, Md.
Smith, Gertrude (Mrs. Thorn), Washington, D. C.
Tyler, Elizabeth, district nursing, New York City.

1897.

Caldwell, Amanda J. (Mrs. Darrell), Dallas, Tex.
Combs, Annie, massage specialist, Washington, D. C.
Green, Lucille (Mrs. Tibbs), St. Paul, Minn.
Griffin, G. Josephine, private nurse, Washington, D. C.
Haithcock, Ada, private nurse, Washington, D. C.

1897—Continued.

King, Annie C. (Mrs. Hughes), Richmond, Va.
Rollins, Willie M. (Mrs. Frazier), Washington, D. C.
Smith, S. May, private nurse, Troy, N. Y.
Thomas, Annie M., private nurse, Washington, D. C.
Thompson, Della R. (Mrs. Davis), Vienna, Va.
Underhill, Katherine P. (Mrs. Wm. Moten), Washington, D. C.
Webb, Eva, private nurse, Washington, D. C.
Warner, Florence A., private nurse, Springfield, Mass.
Young, Lola E. M., private nurse, Greenville, S. C.

1898.

Bannister, Carrie J. (Mrs. Knox), Washington, D. C.
Bennett, Florence R., private nurse, Baltimore, Md.
Cabannis, Martha E., night supervisor, Freedmen's Hospital, Washington, D. C.
Carter, Edith M., private nurse, New Rochelle, N. Y.
Davis, Annie M., private nurse, Shelbyville, Tenn.
Ennis, Sarah J. (Mrs. Brooks), Washington, D. C.
Gaines, Mary R., private nurse, Berkeley, Cal.
Geder, Isabella, private nurse, Binghamton, N. Y.
Hurlong, Mary A., private nurse, Asheville, N. C.
King, Carrie M. (Mrs. Foreman), Washington, D. C.

Occupation and residence of graduates—Continued.

1898—Continued.

Robinson, Amelia A., private nurse, Nashville, Tenn.
Russell, Ruby E., private nurse, Charlottesville, Va.
Stanton, Priscilla (Mrs. Todd), Pittsburgh, Pa.
Sumby, Lillie May, private nurse, Washington, D. C.
Valentine, J. Ella, private nurse, Lebanon, Ind.
Whitson, Clara E. (Mrs. Howe), Washington, D. C.

1899.

Banks, Effie P. (Mrs. Sykes), Indianapolis, Ind.
Brown, Agnes M., private nurse, Meyersdale, Pa.
Coleman, Georgia A., private nurse, Washington, D. C.
Dismond, S. Matthew (Mrs. Dibble), St. Louis, Mo.
Francis, Bertha A., head nurse, Home Hospital, Birmingham, Ala.
Hairston, Lulu C. (Mrs. Crews), Winston, N. C.
Hankins, Mintha C., private nurse, Washington, D. C.
Hendricks, Eliza R. (Mrs. Brown).
Henry, Lillian M., private nurse, Downington, Pa.
Hoge, Carrie M., private nurse, Washington, D. C.
Keemer, Jessie E. (Mrs. Robinson), Providence, R. I.
McEwen, Irene O. (Mrs. Green), Pensacola, Fla.
Rich, Anna, private nurse, Hartford, Conn.
Scott, Helen V. (Mrs. Cole), Swansboro, Ga.
Thompson, Isabella, private nurse, New Orleans, La.
Wilson, Emma C., private nurse, Montgomery, Ala.
Williams, Elmira E., deceased.

1900.

Clarke, Mary F., private nurse, Richmond, Va.
Hamilton, Priscilla, deceased.
Hawkins, Nannie E., private nurse, Charlotte, N. C.
Hunton, Mary A. (Mrs. Gordon), St. Louis, Mo.
Johnson, Hattie B. (Mrs. Cunningham), Owensboro, Ky.
Lewis, Eva P., private nurse, Manassas, Va.
Mickens, Marcella C., private nurse, Pittsburgh, Pa.

1900—Continued.

Middleton, Haga H., private nurse, Charleston, S. C.
Moody, Annie L., private nurse, Washington, D. C.
Smith, Cora V., private nurse, Camden, N. J.
Winfield, Laura, private nurse, Ware, Mass.

1901.

Allen, Margaret A., visiting nurse, Jacksonville, Fla.
Barks, Susan C., private nurse, Washington, D. C.
Campbell, B. N., private nurse, Montgomery, Ala.
Dey, Mary L., private nurse, Philadelphia, Pa.
Hackley, Mamie E. (Mrs. Ash), Philadelphia, Pa.
Hanson, Carrie L., private nurse, Baltimore, Md.
Harrell, Catherine S. (Mrs. Butler), Texas.
Hunter, Bessie, private nurse, Washington, D. C.
Jackson, Eliza A., private nurse, Richmond, Va.
Jones, Mary J., private nurse, Washington, D. C.
Powell, Gussie D., private nurse, Richmond, Va.
Rhone, Charlotte S., private nurse, Newbern, N. C.
Robinson, Frances A., private nurse, Newbern, N. C.
Thomas, Bertha J., head nurse, Freedmen's Hospital, Washington, D. C.
Walcott, Louisa M., private nurse, Rockhill, S. C.
Whitley, Florence A., private nurse, Newbern, N. C.

1902.

Adams, Ella C., private nurse, Philadelphia, Pa.
Baker, Vera L., head nurse, State Hospital, Goldsboro, N. C.
Booth, Mary S., head nurse, Freedmen's Hospital.
Delisse, Augusta V., private nurse, Brooklyn, N. Y.
Dias, Frances C., private nurse, Philadelphia, Pa.
Johnson, Gertrude B., private nurse, Niagara Falls, N. Y.
Mason, Corinna (Mrs. Phillips), Springfield, Mass.
Nichols, Florence L. (Mrs. Avant), Charlotte, N. C.
Rogers, Amanda, private nurse, Indianapolis, Ind.

Occupation and residence of graduates—Continued.

1902—Continued.

Roper, Maggie A., private nurse, Galveston, Tex.
Thompson, Rachel A. (Mrs. Thomas), deceased.

1903.

Balentine, J. L. (Mrs. Dial), Jacksonville, Fla.
Browne, E. M., head nurse, Douglass Hospital, Philadelphia, Pa.
Baltimore, Mary E., private nurse, Harrisburg, Pa.
Christie, Sarah E., private nurse, Chester, Pa.
Coates, Maiella E., private nurse, Washington, D. C.
Hargrave, L. S., private nurse, Trenton, N. J.
Johnson, L. D., private nurse, Warrenton, N. C.
Johnson, Nellie V., private nurse, Abbeville, S. C.
Latney, Carrie L. (Mrs. Bowie), Washington, D. C.
Love, Ellen V., private nurse, Lumberton, N. C.
Purcell, E. J., private nurse, Brunswick, Ga.
Rollins, Clara A., private nurse, Washington, D. C.
Rutherford, Anna L., private nurse, Kingston, N. C.
Sharp, Carrie M. (Mrs. Morgan), Petersburg, Va.
Yarborough, S. V. S., private nurse, Columbus, Ga.

1904.

Baker, Hattie E., private nurse, Darlington, S. C.
Blackwell, W. Lucille (Mrs. Morris), New York, N. Y.
Carter, Mary E., private nurse, Rippon, W. Va.
Carter, Elizabeth V., head nurse, Mercy Hospital, Philadelphia, Pa.
Grant, Anna E. (Mrs. Millen), Savannah, Ga.
Gilmore, Mary E., private nurse, Leavenworth, Kans.
James, Aleathia D. (Mrs. Franklin), Jacksonville, Fla.
Jeffries, Emma M., private nurse, Redbank, N. J.
Jones, Violet, private nurse, Hartford, Conn.
Lewis, Louzetta (Mrs. Mitchell), Montgomery, Ala.
Richardson, Effie V. (Mrs. McCoy), Washington, D. C.
Thomas, Marie E. (Mrs. Jones), Topeka, Kans.

1905.

Braxton, Margaret, private nurse, Hartford, Conn.
Brooks, Alpha E. (Mrs. Jones), Fairmont Heights, D. C.
Carter, Marion M., private nurse, Washington, D. C.
Henderson, Hattie E., private nurse, Cleveland, Ohio.
Holmes, Julia E., private nurse, Plainfield, N. J.
Jefferson, Roxanna M., private nurse, Bristol, Tenn.
Kidd, Bertha M. (Mrs. Harris), Washington, D. C.
Long, Ida E., private nurse, Newark, N. J.
Maston, Mary J., head nurse, Red Cross Sanitarium, Louisville, Ky.
Scott, Julia E., private nurse, New Haven, Conn.
Teabout, Stella, private nurse, Richfield, Springs, N. Y.
Taliaferro, Olivia, private nurse, Anacostia, D. C.
Terry, Jessie C., private nurse, Los Angeles, Cal.
Williams, Daisy M. (Mrs. Moten), Sherman, Tex.
Williams, Mary T., private nurse, Ware Neck, Va.
Wilson, Annabel, private nurse, Baltimore, Md.

1906.

Barnes, Annie, private nurse, Baltimore, Md.
Bearce, Daisy M., private nurse, Rye, N. Y.
Burress, Mary E. (Mrs. Wormley), Ardwick, S. C.
Gordon, Mary B., private nurse, Washington, D. C.
Hall, Iona M., private nurse, Troy, Ohio.
Henderson, Sara O., private nurse, Newport, R. I.
Johnson, Harriett C., private nurse, Cleveland, Ohio.
Lewis, Willie A., private nurse, Atlanta, Ga.
Lucas, Marion V. (Mrs. Monroe), Washington, D. C.
McDougal, Colota M., district nurse, Indianapolis, Ind.
McKnight, Viola, superintendent of nurses, Mercy Hospital, Philadelphia, Pa.
Marshall, Mary E., private nurse, Morristown, Tenn.
Merritt, Mary E., superintendent of nurses, Mitchell Hospital, Leavenworth, Kans.

Occupation and residence of graduates—Continued.

1907.

Bullock, Blanche V., private nurse, Richmond, Va.
Childs, Helen D., private nurse, Philadelphia, Pa.
Escoffery, Lula M., private nurse, Atlantic City, N. J.
Harmon, Nannie M., private nurse, Tip Top, Va.
Porter, Susan H., dean woman's department, Tuskegee, Ala.
Payton, Lillian M., private nurse, Washington, D. C.
Peck, Alice M. (Mrs. Anderson), Boston, Mass.
Rose, Julia M., private nurse, Lynchburg, Va.
Slocum, Mary E., private nurse, Providence, R. I.
Smith, Minnie M., private nurse, Amherst, Mass.
Taylor, Loretta P. (Mrs. Banks), Washington, D. C.
Wright, Nena J. (Mrs. Jackson), New York City.

1908.

Briggs, Cornelia K., private nurse, Troy, N. Y.
Denning, Clara S. (Mrs. Robinson), Baltimore, Md.
Douglass, Kate E. (Mrs. Barter), Newark, N. J.
Donaldson, Vesta L., private nurse, Ocean Grove, N. J.
Fray, Julia (Mrs. Clark), Chicago, Ill.
Henderson, Jamima S., private nurse, Spring Lake, N. J.
Jones, Bertie L., private nurse, Harrisburg, Pa.
Nicholas, Beatrice E., private nurse, Baltimore, Md.
Proctor, Eva M., private nurse, Newark, N. J.
Robinson, Alice E., private nurse, Hartsville, S. C.
Reynolds, Agnes, private nurse, Ironton, Ohio.

1909.

Allen, Irene P. (Mrs. Martin), deceased.
Burnett, Sarah L., private nurse, Washington, D. C.
Coates, Nana E., Battle Creek, Mich.
Curtis, Minnie M., private nurse, Marietta, Ohio.
Green, Lillian C. (Mrs. Davis), Washington, D. C.
Hall, Anita B., private nurse, Baltimore, Md.
Hankle, Areatha B. (Mrs. Bailey), St. Louis, Mo.
Johnson, Lillian A., private nurse, Poughkeepsie, N. Y.

1909—Continued.

Lewis, Charlotte M., private nurse, Atlanta, Ga.
Parker, Mary E., private nurse, Williamsport, Pa.
Sheppard, Emma D., private nurse, Meyersdale, Pa.
Smith, Annie M., private nurse, Jacksonville, Fla.
Spears, Lillian, private nurse, Providence, R. I.
Wainwright, Melinda E., Charles Town, W. Va.

1910.

Amby, Grace, married, Baltimore, Md.
Brown, Nellie V., private nurse, Meyersdale, Pa.
Howard, Mrs. Sankey B., Goldsboro, N. C.
Gates, Eugene J. P., private nurse, Washington, D. C.
Gilliam, Octavia T., private nurse, Hanover, Va.
Hutchinson, Mabel M., private nurse, Lockport, N. Y.
Jackson, Sara E., private nurse, Steelton, Pa.
Jordan, Maggie M., private nurse, Washington, D. C.
McClaine, Nettie L. (Mrs. George), Paducah, Ky.
Richardson, Lizzette S., private nurse, Washington, D. C.
Reid, Marion M., private nurse, Denver, Colo.

1911.

Blackburn, Clara E. (Mrs. Miller), Wheeling, W. Va.
Clay, Eva Virginia, private nurse, Williamsport, Pa.
Coates, Edna May (Mrs. Gloster), Wheeling, W. Va.
Green, Emily Estella (Mrs. Allen), Washington, D. C.
Grisby, Sara Elizabeth, private nurse, Washington, D. C.
Harris, Florence M., private nurse, Brooklyn, N. Y.
Hopkins, Jennie C., private nurse, New York City.
Patton, Jessie Boyd, superintendent of nurses, Mercy Hospital, Nashville, Tenn.
Piper, Ida J. (Mrs. Robinson), Boston, Mass.
Price, Mae Irene, private nurse, Baltimore, Md.
Stevens, Nettie Bentley, private nurse, Atlanta, Ga.
Thompson, Lulu E., private nurse, Washington, D. C.
York, Martella M., superintendent of nurses, St. Agnes Hospital, Raleigh, N. C.

Occupation and residence of graduates—Continued.

1912.

Abner, Carrie (Mrs. Bumbry), Chicago, Ill.
Butler, Marguerite C., private nurse, Boston, Mass.
Carter, Elizabeth F. A., private nurse, Washington, D. C.
Christian, Estelle A., private nurse, Washington, D. C.
Eaton, Sadie E., private nurse, Raleigh, N. C.
Simmons, Mary A. (Mrs. Moore), Magnolia, N. J.

1913.

Green, Cecilia M., head nurse, Freedmen's Hospital, Washington, D. C.
Berkley, Pearl B., private nurse, Washington, D. C.
Garrott, Roberta Lee, private nurse, Washington, D. C.
Howland, Elizabeth B., private nurse, Brooklyn, N. Y.
Wingate, Elizabeth E., private nurse, Charleston, S. C.
Davis, Alice E., private nurse, Frederick, Md.
Lawson, Bessie M., private nurse, Pittsburgh, Pa.
Elliott, Frances R., private nurse, Washington, D. C.
Jordan, Emily M., private nurse, Washington, D. C.
Jackson, Edna V., private nurse, Baltimore, Md.
Kemper, Etta C., Barnett Hospital, Huntington, W. Va.
Ockrey, Minnie, Edward's Hospital, Bluefield, W. Va.
Russell, Josephine M., private nurse, Washington, D. C.

1913—Continued.

Barnes, Mayme, Central State Hospital, Petersburg, Va.
Henry, Eva G., private nurse, Washington, D. C.
Meredith, Angie E. (deceased).
Anderson, Maude H., private nurse, Philadelphia, Pa.

1914.

Byrd, Carrie Lena, private nurse, Petersburg, Va.
Cargyle, Laura Aurelia, private nurse, Atlanta, Ga.
Clark, Ophelia Elizabeth, private nurse, Indianapolis, Ind.
Jackson, Alice Veronica, Central State Hospital, Petersburg, Va.
Jordan, Blanche Lillian, private nurse, Washington, D. C.
Minor, Ethel Mae, private nurse, Blue Plains, D. C.
Mundin, Maude E., private nurse, Richmond, Va.
Robinson, Adaline, private nurse, Washington, D. C.
Shelton, Willie Belle, private nurse, Buffalo, N. Y.
Smith, Lena Mae, private nurse, Washington, D. C.
Thompson, Edna Sylvia, private nurse, New York City.
Varner, Amanda Evalina, private nurse, Atlanta, Ga.
Walker, Olive Glennie, private nurse, Cleveland, Ohio.
Williamson, Lulu Howard, Lomax Hospital, Bluefield, W. Va.

Very respectfully,

W. A. WARFIELD,
Surgeon in Chief.

The SECRETARY OF THE INTERIOR.

REPORT OF THE PRESIDENT OF HOWARD UNIVERSITY.

ROSTER OF OFFICERS.

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Term expires 1916.

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Term expires 1917.

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Hon. FRANKLIN KNIGHT LANE, Secretary of the Interior.

REPORT OF THE PRESIDENT OF HOWARD UNIVERSITY.

HOWARD UNIVERSITY,
Washington, D. C., July 1, 1915.

SIR: I have the honor to submit for Howard University the following report, showing the condition of the institution on the 1st day of July, 1915, "embracing therein the number of pupils received and discharged or leaving the same for any cause during the year and the number remaining; also the branches of knowledge and industry taught and the progress made therein, together with a statement showing the receipts of the institution and from what sources, and its disbursements and for what objects."

REGISTRATION.

There were in attendance during the year 1,452 students from 36 States and 6 foreign countries. This number does not include 61 students who took work in the school of theology by correspondence. The number of students in the different departments was as follows:

Students during year ended June 30, 1915.

College of arts and sciences	365
Teachers' college	202
School of manual arts and applied sciences	10
Conservatory of music	94
School of theology	110
School of medicine	288
School of law	106
Academy	298
Commercial college	96
Total	1,569
Names duplicated because of students taking special courses in different departments	117
Net total	1,452

It will be seen that this number is slightly less than that of 1913–14, which was 1,463.

The total number graduated was 205, distributed as follows:

Graduates in 1915.

College of arts and sciences	80
Teachers' college	80
Normal course	5
Kindergarten	8
Domestic science	4
School of manual arts and applied sciences	2
Conservatory of music	1

School of theology	10
Medical College	20
Dental College	24
Pharmaceutic College	13
School of law	21
Academy	29
Commercial college	13
Total	205

We have added no new departments to the 10 well-established ones under 10 different faculties, which we have had for some years. The number is sufficient for our work as at present constituted.

Of our 10 departments, 3 are professional schools—viz, theology, medicine, law.

THE SCHOOL OF THEOLOGY.

No part of any appropriation by Congress has ever been applied to support this department. It is under no outside control or direction. The school is interdenominational and welcomes all who are preparing for the best service in moral and religious work. The great effort made in this branch of our work is to train young colored men to become centers of light and well-ordered living in the communities in which they may settle. A wholesome, well-rounded method of thinking is sought for in all the courses of study. The service to the people which is being rendered in city and country by our graduates shows the practical aims which we cherish and our success in carrying them out.

The correspondence work of this school is growing in importance and numbers. Many busy pastors are getting great good from the instruction they receive in this way. The work of the school is being strengthened and widened from year to year.

The roll of students for the year was as follows:

Students in school of theology.

Seniors	13
Middlers	15
Juniors	9
Special students	5
Unclassified	8
	50
Evening institute:	
Fourth year	8
Third year	6
Second year	11
First year	21
	46
Correspondence students matriculated as university students	14
Total	110
Correspondence students not matriculated as university students	61

Of these, 6 received degrees, 7 received diplomas, and 7 received testimonials.

THE SCHOOL OF MEDICINE.

The relative numbers of students in the three colleges of the school of medicine change from year to year. Just now more are entering dentistry and pharmacy than in recent years. The quality of student material remains good. Indeed, it is steadily improving from year to year. The demand we make for two years of college work as a requirement for admission to the study of medicine is working a great good in preventing unprepared students from entering. Our requirements are as high as those of the best schools of the country. The school is in "Class A" and is registered with the conjoint board of Great Britain. Our hospital facilities are unexcelled anywhere. During the last year further very important improvements have been made in lecture rooms and laboratories. Concrete floors have been laid in the pharmaceutical and some other laboratories.

The greatest need of the department is for an adequate endowment, because no high-class medical school like ours can be permanently conducted upon tuitions. No congressional aid goes for payment of salaries in this department. The increasing attention being given in the country at large to hygienic, sanitary, dietetic, and other preventive medical measures makes it especially important that our school keep abreast of this form of service to the people. Trained colored physicians should be familiar with this side of their work because of the great need among their people. The department is adding to its facilities in these respects.

The equipment of the dental college, which was largely carried through last year, has been made more complete, until the rooms are among the best to be found anywhere. The students have a great supply of work in the cases which come from all parts of the community, and which are treated under the supervision of highly trained demonstrators.

The school of medicine has received during the year from congressional aid for its three colleges $7,000, which has all been expended upon laboratories and supplies as stipulated in the budget.

Our graduates are located in all parts of the country—North, South, East, and West—and are doing exceptional and notable work.

The roll of students for the year was as follows:

Students in medical school.

Seniors	25
Juniors	24
Sophomores	17
Freshmen	27
Senior dental	29
Second-year dental	46
First-year dental	48
Senior pharmaceutic	14
Second-year pharmaceutic	22
First-year pharmaceutic	36
Total	288

Of these, 57 received degrees—20 in medicine, 24 in dentistry, 13 in pharmacy.

School of theology	10
Medical College	20
Dental College	24
Pharmaceutic College	13
School of law	21
Academy	29
Commercial college	13
Total	205

We have added no new departments to the 10 well-established ones under 10 different faculties, which we have had for some years. The number is sufficient for our work as at present constituted.

Of our 10 departments, 3 are professional schools—viz, theology, medicine, law.

THE SCHOOL OF THEOLOGY.

No part of any appropriation by Congress has ever been applied to support this department. It is under no outside control or direction. The school is interdenominational and welcomes all who are preparing for the best service in moral and religious work. The great effort made in this branch of our work is to train young colored men to become centers of light and well-ordered living in the communities in which they may settle. A wholesome, well-rounded method of thinking is sought for in all the courses of study. The service to the people which is being rendered in city and country by our graduates shows the practical aims which we cherish and our success in carrying them out.

The correspondence work of this school is growing in importance and numbers. Many busy pastors are getting great good from the instruction they receive in this way. The work of the school is being strengthened and widened from year to year.

The roll of students for the year was as follows:

Students in school of theology.

Seniors	13
Middlers	15
Juniors	9
Special students	5
Unclassified	8
	50
Evening institute:	
Fourth year	8
Third year	6
Second year	11
First year	21
	46
Correspondence students matriculated as university students	14
Total	110
Correspondence students not matriculated as university students	61

Of these, 6 received degrees, 7 received diplomas, and 7 received testimonials.

THE SCHOOL OF MEDICINE.

The relative numbers of students in the three colleges of the school of medicine change from year to year. Just now more are entering dentistry and pharmacy than in recent years. The quality of student material remains good. Indeed, it is steadily improving from year to year. The demand we make for two years of college work as a requirement for admission to the study of medicine is working a great good in preventing unprepared students from entering. Our requirements are as high as those of the best schools of the country. The school is in "Class A" and is registered with the conjoint board of Great Britain. Our hospital facilities are unexcelled anywhere. During the last year further very important improvements have been made in lecture rooms and laboratories. Concrete floors have been laid in the pharmaceutical and some other laboratories.

The greatest need of the department is for an adequate endowment, because no high-class medical school like ours can be permanently conducted upon tuitions. No congressional aid goes for payment of salaries in this department. The increasing attention being given in the country at large to hygienic, sanitary, dietetic, and other preventive medical measures makes it especially important that our school keep abreast of this form of service to the people. Trained colored physicians should be familiar with this side of their work because of the great need among their people. The department is adding to its facilities in these respects.

The equipment of the dental college, which was largely carried through last year, has been made more complete, until the rooms are among the best to be found anywhere. The students have a great supply of work in the cases which come from all parts of the community, and which are treated under the supervision of highly trained demonstrators.

The school of medicine has received during the year from congressional aid for its three colleges $7,000, which has all been expended upon laboratories and supplies as stipulated in the budget.

Our graduates are located in all parts of the country—North, South, East, and West—and are doing exceptional and notable work.

The roll of students for the year was as follows:

Students in medical school.

Seniors	25
Juniors	24
Sophomores	17
Freshmen	27
Senior dental	29
Second-year dental	46
First-year dental	48
Senior pharmaceutic	14
Second-year pharmaceutic	22
First-year pharmaceutic	36
Total	288

Of these, 57 received degrees—20 in medicine, 24 in dentistry, 13 in pharmacy.

Occupation and residence of graduates—Continued.

1902—Continued.

Roper, Maggie A., private nurse, Galveston, Tex.
Thompson, Rachel A. (Mrs. Thomas), deceased.

1903.

Balentine, J. L. (Mrs. Dial), Jacksonville, Fla.
Browne, E. M., head nurse, Douglass Hospital, Philadelphia, Pa.
Baltimore, Mary E., private nurse, Harrisburg, Pa.
Christie, Sarah E., private nurse, Chester, Pa.
Coates, Maiella E., private nurse, Washington, D. C.
Hargrave, L. S., private nurse, Trenton, N. J.
Johnson, L. D., private nurse, Warrenton, N. C.
Johnson, Nellie V., private nurse, Abbeville, S. C.
Latney, Carrie L. (Mrs. Bowie), Washington, D. C.
Love, Ellen V., private nurse, Lumberton, N. C.
Purcell, E. J., private nurse, Brunswick, Ga.
Rollins, Clara A., private nurse, Washington, D. C.
Rutherford, Anna L., private nurse, Kingston, N. C.
Sharp, Carrie M. (Mrs. Morgan), Petersburg, Va.
Yarborough, S. V. S., private nurse, Columbus, Ga.

1904.

Baker, Hattie E., private nurse, Darlington, S. C.
Blackwell, W. Lucille (Mrs. Morris), New York, N. Y.
Carter, Mary E., private nurse, Rippon, W. Va.
Carter, Elizabeth V., head nurse, Mercy Hospital, Philadelphia, Pa.
Grant, Anna E. (Mrs. Millen), Savannah, Ga.
Gilmore, Mary E., private nurse, Leavenworth, Kans.
James, Aleathia D. (Mrs. Franklin), Jacksonville, Fla.
Jeffries, Emma M., private nurse, Redbank, N. J.
Jones, Violet, private nurse, Hartford, Conn.
Lewis, Louzetta (Mrs. Mitchell), Montgomery, Ala.
Richardson, Effie V. (Mrs. McCoy), Washington, D. C.
Thomas, Marie E. (Mrs. Jones), Topeka, Kans.

1905.

Braxton, Margaret, private nurse, Hartford, Conn.
Brooks, Alpha E. (Mrs. Jones), Fairmont Heights, D. C.
Carter, Marion M., private nurse, Washington, D. C.
Henderson, Hattie E., private nurse, Cleveland, Ohio.
Holmes, Julia E., private nurse, Plainfield, N. J.
Jefferson, Roxanna M., private nurse, Bristol, Tenn.
Kidd, Bertha M. (Mrs. Harris), Washington, D. C.
Long, Ida E., private nurse, Newark, N. J.
Maston, Mary J., head nurse, Red Cross Sanitarium, Louisville, Ky.
Scott, Julia E., private nurse, New Haven, Conn.
Teabout, Stella, private nurse, Richfield, Springs, N. Y.
Taliaferro, Olivia, private nurse, Anacostia, D. C.
Terry, Jessie C., private nurse, Los Angeles, Cal.
Williams, Daisy M. (Mrs. Moten), Sherman, Tex.
Williams, Mary T., private nurse, Ware Neck, Va.
Wilson, Annabel, private nurse, Baltimore, Md.

1906.

Barnes, Annie, private nurse, Baltimore, Md.
Bearce, Daisy M., private nurse, Rye, N. Y.
Burress, Mary E. (Mrs. Wormley), Ardwick, S. C.
Gordon, Mary B., private nurse, Washington, D. C.
Hall, Iona M., private nurse, Troy, Ohio.
Henderson, Sara O., private nurse, Newport, R. I.
Johnson, Harriett C., private nurse, Cleveland, Ohio.
Lewis, Willie A., private nurse, Atlanta, Ga.
Lucas, Marion V. (Mrs. Monroe), Washington, D. C.
McDougal, Colota M., district nurse, Indianapolis, Ind.
McKnight, Viola, superintendent of nurses, Mercy Hospital, Philadelphia, Pa.
Marshall, Mary E., private nurse, Morristown, Tenn.
Merritt, Mary E., superintendent of nurses, Mitchell Hospital, Leavenworth, Kans.

Occupation and residence of graduates—Continued.

1907.

Bullock, Blanche V., private nurse, Richmond, Va.
Childs, Helen D., private nurse, Philadelphia, Pa.
Escoffery, Lula M., private nurse, Atlantic City, N. J.
Harmon, Nannie M., private nurse, Tip Top, Va.
Porter, Susan H., dean woman's department, Tuskegee, Ala.
Payton, Lillian M., private nurse, Washington, D. C.
Peck, Alice M. (Mrs. Anderson), Boston, Mass.
Rose, Julia M., private nurse, Lynchburg, Va.
Slocum, Mary E., private nurse, Providence, R. I.
Smith, Minnie M., private nurse, Amherst, Mass.
Taylor, Loretta P. (Mrs. Banks), Washington, D. C.
Wright, Nena J. (Mrs. Jackson), New York City.

1908.

Briggs, Cornelia K., private nurse, Troy, N. Y.
Denning, Clara S. (Mrs. Robinson), Baltimore, Md.
Douglass, Kate E. (Mrs. Barter), Newark, N. J.
Donaldson, Vesta L., private nurse, Ocean Grove, N. J.
Fray, Julia (Mrs. Clark), Chicago, Ill.
Henderson, Jamima S., private nurse, Spring Lake, N. J.
Jones, Bertie L., private nurse, Harrisburg, Pa.
Nicholas, Beatrice E., private nurse, Baltimore, Md.
Proctor, Eva M., private nurse, Newark, N. J.
Robinson, Alice E., private nurse, Hartsville, S. C.
Reynolds, Agnes, private nurse, Ironton, Ohio.

1909.

Allen, Irene P. (Mrs. Martin), deceased.
Burnett, Sarah L., private nurse, Washington, D. C.
Coates, Nana E., Battle Creek, Mich.
Curtis, Minnie M., private nurse, Marietta, Ohio.
Green, Lillian C. (Mrs. Davis), Washington, D. C.
Hall, Anita B., private nurse, Baltimore, Md.
Hankle, Areatha B. (Mrs. Bailey), St. Louis, Mo.
Johnson, Lillian A., private nurse, Poughkeepsie, N. Y.

1909—Continued.

Lewis, Charlotte M., private nurse, Atlanta, Ga.
Parker, Mary E., private nurse, Williamsport, Pa.
Sheppard, Emma D., private nurse, Meyersdale, Pa.
Smith, Annie M., private nurse, Jacksonville, Fla.
Spears, Lillian, private nurse, Providence, R. I.
Wainwright, Melinda E., Charles Town, W. Va.

1910.

Amby, Grace, married, Baltimore, Md.
Brown, Nellie V., private nurse, Meyersdale, Pa.
Howard, Mrs. Sankey B., Goldsboro, N. C.
Gates, Eugene J. P., private nurse, Washington, D. C.
Gilliam, Octavia T., private nurse, Hanover, Va.
Hutchinson, Mabel M., private nurse, Lockport, N. Y.
Jackson, Sara E., private nurse, Steelton, Pa.
Jordan, Maggie M., private nurse, Washington, D. C.
McClaine, Nettie L. (Mrs. George), Paducah, Ky.
Richardson, Lizzette S., private nurse, Washington, D. C.
Reid, Marion M., private nurse, Denver, Colo.

1911.

Blackburn, Clara E. (Mrs. Miller), Wheeling, W. Va.
Clay, Eva Virginia, private nurse, Williamsport, Pa.
Coates, Edna May (Mrs. Gloster), Wheeling, W. Va.
Green, Emily Estella (Mrs. Allen), Washington, D. C.
Grisby, Sara Elizabeth, private nurse, Washington, D. C.
Harris, Florence M., private nurse, Brooklyn, N. Y.
Hopkins, Jennie C., private nurse, New York City.
Patton, Jessie Boyd, superintendent of nurses, Mercy Hospital, Nashville, Tenn.
Piper, Ida J. (Mrs. Robinson), Boston, Mass.
Price, Mae Irene, private nurse, Baltimore, Md.
Stevens, Nettie Bentley, private nurse, Atlanta, Ga.
Thompson, Lulu E., private nurse, Washington, D. C.
York, Martella M., superintendent of nurses, St. Agnes Hospital, Raleigh, N. C.

Occupation and residence of graduates—Continued.

1912.

Abner, Carrie (Mrs. Bumbry), Chicago, Ill.
Butler, Marguerite C., private nurse, Boston, Mass.
Carter, Elizabeth F. A., private nurse, Washington, D. C.
Christian, Estelle A., private nurse, Washington, D. C.
Eaton, Sadie E., private nurse, Raleigh, N. C.
Simmons, Mary A. (Mrs. Moore), Magnolia, N. J.

1913.

Green, Cecilia M., head nurse, Freedmen's Hospital, Washington, D. C.
Berkley, Pearl B., private nurse, Washington, D. C.
Garrott, Roberta Lee, private nurse, Washington, D. C.
Howland, Elizabeth B., private nurse, Brooklyn, N. Y.
Wingate, Elizabeth E., private nurse, Charleston, S. C.
Davis, Alice E., private nurse, Frederick, Md.
Lawson, Bessie M., private nurse, Pittsburgh, Pa.
Elliott, Frances R., private nurse, Washington, D. C.
Jordan, Emily M., private nurse, Washington, D. C.
Jackson, Edna V., private nurse, Baltimore, Md.
Kemper, Etta C., Barnett Hospital, Huntington, W. Va.
Ockrey, Minnie, Edward's Hospital, Bluefield, W. Va.
Russell, Josephine M., private nurse, Washington, D. C.

1913—Continued.

Barnes, Mayme, Central State Hospital, Petersburg, Va.
Henry, Eva G., private nurse, Washington, D. C.
Meredith, Angie E. (deceased).
Anderson, Maude H., private nurse, Philadelphia, Pa.

1914.

Byrd, Carrie Lena, private nurse, Petersburg, Va.
Cargyle, Laura Aurelia, private nurse, Atlanta, Ga.
Clark, Ophelia Elizabeth, private nurse, Indianapolis, Ind.
Jackson, Alice Veronica, Central State Hospital, Petersburg, Va.
Jordan, Blanche Lillian, private nurse, Washington, D. C.
Minor, Ethel Mae, private nurse, Blue Plains, D. C.
Mundin, Maude E., private nurse, Richmond, Va.
Robinson, Adaline, private nurse, Washington, D. C.
Shelton, Willie Belle, private nurse, Buffalo, N. Y.
Smith, Lena Mae, private nurse, Washington, D. C.
Thompson, Edna Sylvia, private nurse, New York City.
Varner, Amanda Evalina, private nurse, Atlanta, Ga.
Walker, Olive Glennie, private nurse, Cleveland, Ohio.
Williamson, Lulu Howard, Lomax Hospital, Bluefield, W. Va.

Very respectfully,

W. A. WARFIELD,
Surgeon in Chief.

The SECRETARY OF THE INTERIOR.

REPORT OF THE PRESIDENT OF HOWARD UNIVERSITY.

Expenditure of appropriation for manual arts and applied sciences.

One director and instructor in civil engineering	$1,600.00	
One instructor in mechanical engineering and woodworking	1,400.00	
One instructor in electrical engineering	900.00	
One instructor in printing	1,200.00	
One instructor in domestic science	750.00	
One instructor in domestic arts	750.00	
One professor of the biological sciences, in part	750.00	
Three janitors	202.00	
		$7,552.00
Equipment		2,230.93
Supplies, etc		2,217.07
Total		12,000.00

Expenditure of appropriation for natural-history studies and laboratories.

Chemical laboratory	$600.00
Biological laboratory	600.00
Physics laboratory	600.00
Nature-study laboratory	200.00
Total	2,000.00

Expenditure of appropriation for repairs of buildings and improvement of grounds.

Repairs to buildings	$8,477.15
Improvement of grounds	1,522.85
Total	10,000.00

Expenditure of appropriation for libraries.

Academic library books, etc	$1,224.06
Law-library books, etc	275.94
Total	1,500.00

Expenditure of appropriation for fuel and light.

Fuel and labor, central heating plant	$3,000.00
Other fuel	500.00
Total	3,500.00

Expenditure of appropriation for school of medicine.

Equipment and apparatus	$1,984.26
Laboratory supplies	1,938.19
Repairs to laboratories and buildings	3,077.55
Total	7,000.00

Distribution of expenditures from Government appropriations.

Appropriations.	Amount.	Expenditures.	
		Current fund.	Permanent-plant fund.
Disbursed through chief disbursing clerk of the Interior Department:			
Maintenance, salaries, etc.	$65,000.00		
Salaries		$64,917.00	
Ice		48.68	
Stationery		34.38	
Department of manual arts	12,000.00	9,769.07	$2,230.93
Libraries, equipment, books, etc.	1,500.00		
Law		48.29	227.65
Academic		112.80	1,111.26
Improvement of grounds and repairs of buildings	10,000.00	10,000.00	
School of medicine, repairs to laboratories, laboratory supplies, and equipment	7,000.00	5,015.74	1,984.26
Laboratories, material, and apparatus	2,000.00	599.79	1,400.21
Fuel and light	3,500.00	3,500.00	
Total credited permanent-fund account			6,954.31
Total credited current fund		94,045.69	94,045.69
Total appropriation	101,000.00		101,000.00

General summaries income and expenditures for the year ended June 30, 1915.

CURRENT FUND.

Total income for current expenditure for year		$164,129.31
Total current expenditure		162,760.79
Net excess for current fund for year ended June 30, 1915		1,368.52
Less expenditure for permanent plant where there were no special funds		1,355.45
Net increase of current fund		13.07

PERMANENT FUND.

Total income for increase of educational plant		7,112.77
Total expenditure for increase of educational plant, not including amount charged current fund		6,954.31

SUMMARY OF ABOVE.

Income as above		171,242.08
Expenditures as above		171,070.55

SUMMARY OF ALL INCOME AND EXPENDITURE.

Income as above		171,242.08
Additional income:		
Boarding hall	$16,694.75	
Dormitories	7,677.00	
Athletic	4,007.33	
Bookstore	436.06	
Scholarships and gratuities to students	2,609.72	
Gymnasium	1,317.21	
		32,742.07
Total income for all purposes		203,984.15
Expenditure as above		171,070.55
Additional expenditure:		
Boarding hall	16,694.75	
Dormitories	7,677.00	
Athletic	4,007.33	
Bookstore	436.06	
Scholarships and gratuities to students	2,609.72	
Gymnasium	1,317.21	
		32,742.07
Total expenditures for all purposes		203,812.62

SOURCES OF INCOME.

Donations		$2,739.63
United States Government appropriation		101,000.00
Income from endowments		14,187.87
From students		54,531.67
Miscellaneous		1,392.63
		173,851.80
Less scholarships and gratuities to students		2,609.72
Total income as above		171,242.08
Income as above		171,242.08
Additional income:		
Boarding hall	$16,694.75	
Dormitories	7,677.00	
Athletic	4,007.33	
Bookstore	436.06	
For scholarships and gratuities to students	2,609.72	
		31,424.86
Total		202,666.94

Balance sheet June 30, 1915.

CURRENT FUND.

Assets:		
Cash in banks and on hand		$1,255.01
Accounts receivable		10,513.15
Supplies		2,294.18
Prepaid insurance		903.72
Total current assets		14,966.06
Liabilities:		
Notes payable		4,800.00
Accounts payable		4,976.72
Students' accounts prepaid		236.50
Total current liabilities		10,013.22
Surplus of current assets		4,952.84
Total		14,966.06

PERMANENT FUND.

Investment assets:		
Securities		146,880.00
Productive real estate	$178,022.40	
Less mortgages	21,500.00	
		156,522.40
Unproductive land		98,102.03
Total investment assets		401,504.43
Cash on hand for investment		7,878.70
Total		409,383.13
Endowment funds, etc.:		
Endowment capital accounts—		
Funds for general purposes		161,007.42
Funds for designated purposes		148,010.79
Land fund (unrestricted fund)—		
As at June 30, 1914	105,346.44	
Less difference between book value and proceeds of sale of lots C and 29 and 30, square 1055	7,359.29	
		97,987.15
Unexpended balance of permanent plant fund		2,350.27
Fund held in trust: Arts and sciences aid fund		27.50
Total		409,383.13

EDUCATIONAL PLANT, LANDS, BUILDINGS, AND EQUIPMENT.

Land, buildings, and equipment of educational plant	$1,307,135.61
Educational plant capital funds	1,307,135.61

Income and expenditures, current fund, fiscal year ended June 30, 1915.

INCOME.

Income from students:		
College of arts and sciences, teachers' college, commercial college, and academy incidental, matriculation, and graduation fees	$14,923.48	
Academic laboratory fees	921.53	
School of manual arts and applied sciences, printing office, fees, etc	2,082.89	
School of theology, incidental and matriculation fees	428.75	
School of law, tuition, matriculation, and graduation fees	8,888.70	
School of medicine, tuition, matriculation, graduation, and laboratory fees	28,099.00	
Library fees	1,219.33	
Music department, tuition and practice fees	2,967.99	
		$54,531.67
Income from investments of—		
Endowment for general purposes	7,170.87	
Endowment for designated purposes	7,017.50	
		14,187.87
United States appropriation for current expenses		94,045.69
Gifts as per donors' list:		
For general purposes	116.00	
For designated purposes	2,598.63	
		2,714.63
Income from other sources:		
Interest	324.78	
Rent	500.00	
Post-office	42.00	
Miscellaneous	103.76	
Net income from dining hall	.84	
Net income from gymnasium	287.79	
		1,259.17
Total		166,739.03
Less amount given students in scholarships and gratuities		2,609.72
Total current income		164,129.31

EXPENDITURE.

Departmental expenses:		
College of arts and sciences, teachers' college, commercial college, and academy—		
Salaries	$51,195.73	
Supplies and expenses	3,399.97	
		54,595.70
Academic laboratories		1,521.82
School of manual arts and applied sciences:		
Salaries	2,350.00	
Supplies and expenses	9,405.31	
		11,755.31
School of theology		7,108.52
School of law		9,285.07
School of medicine:		
Expenses	36,234.75	
Less dental infirmary receipts	1,985.40	
		34,249.35

Carnegie library		$3,638.77
Y. M. C. A. salary		1,200.00
Music department:		
Salaries	$3,175.00	
Supplies and expenses	544.24	
		3,719.24
Dormitories:		
Salaries	3,461.35	
Renewals, supplies, and expenses	5,791.84	
	9,253.19	
Less receipts	7,677.00	
		1,576.19
Dining hall:		
Salaries	1,225.90	
Renewals, supplies, and expenses	15,468.85	
	16,694.75	
Less receipts	16,695.59	
Net credit carried to income for current purposes	.84	
Bookstore:		
Supplies and expenses	467.71	
Less receipts	436.06	
		31.65
Smith textbook expenditure	28.75	
Maynard prize-debate expenditure	15.00	
		43.75
Gymnasium:		
Salaries	1,194.00	
Supplies and expenses	123.21	
	1,317.21	
Less receipts	1,605.00	
Net credit carried to income for current purposes	287.79	
Administrative and general expenses:		
Salaries of president, secretary, treasurer, and auditor	6,650.00	
Salaries of assistants, stenographers, etc	6,024.87	
Telephone and telegraph	715.18	
Printing and stationery	602.44	
Postage	231.08	
Traveling	274.32	
Advertising	487.33	
Publication expenses	161.63	
Interest	43.62	
Other general expenses	790.52	
		15,980.99
Operation and maintenance of plant:		
Salaries and wages	3,307.22	
Heat, light, and power	1,621.08	
Repairs to buildings	8,562.31	
Care and improvement of grounds	4,016.43	
Miscellaneous	255.81	
Insurance	292.08	
		18,054.93
Total		162,760.79

Income disbursed for permanent plant fund for year ended June 30, 1915.

United States Government appropriation for increase of educational plant:	
Manual arts department	$2,230.93
Library equipment and books—	
Law	227.65
Academic	1,111.26
Laboratories equipment—	
School of medicine	1,984.26
Physics	528.48
Biology	502.90
Chemistry	235.44
Nature study	133.39
Total	6,954.31

Expenditure from permanent plant fund for year ended June 30, 1915.

Equipment for—	
Manual arts department	$2,230.93
Law library	227.65
Academic library	1,111.26
School of medicine laboratory	1,984.26
Physics laboratory	528.48
Biology laboratory	502.90
Chemistry laboratory	235.44
Nature-study laboratory	133.39
Total	6,954.31

Endowment funds, with income.

Names of funds for designated purposes.		Principal.	Income.
Scholarship aid		$19,511.32	$1,110.57
Lincoln memorial prize scholarship		700.00	35.00
Thaddeus Stevens professorship		2,200.00	110.00
Grebel professorship		2,450.00	122.50
Whittier professorship		875.00	43.75
Martha Spaulding aid		8,828.26	441.41
J. P. Thompson scholarship aid		260.00	13.00
Edward Smith textbook		500.00	25.00
Hartford reading room		425.00	21.25
Mary B. Patton scholarship aid		1,200.00	60.00
Stone professorship of theology		40,000.00	1,787.13
Francis B. Schoals scholarship aid		6,000.00	300.00
William E. Dodge scholarship aid		5,000.00	250.00
Frederick Douglass scholarship aid		8,503.11	425.15
J. K. McLean scholarship aid		1,000.00	50.00
Orange Valley Church scholarship aid		1,000.00	50.00
Horace Ford scholarship aid		1,000.00	50.00
Thomas Cropper Riley scholarship aid		1,000.00	50.00
William B. Patton scholarship aid		1,000.00	50.00
William B. Patton memorial professorship		12.10	.61
John W. Alvord scholarship aid		4,000.00	183.00
Alumni professorship		25.00	1.25
Caroline Patton Hatch student aid		200.00	10.00
School of theology alumni professorship		457.00	22.85
Pomeroy scholarship		2,500.00	125.00
School of medicine		15,000.00	750.00
Commercial (normal) department aid		107.00	5.35
Ewell theological professorship		1,000.00	44.66
Emily H. Moir theological professorship		16,500.00	825.00
Henry G. Maynard prize debate		500.00	25.00
As at June 30, 1914	$151,763.79		
Less law professorship transferred to general endowment fund.	10,010.00		
		141,753.79	.....
Received during year:			
Emily H. Moir theological professorship		6,200.00	40.00
Intercollegiate debating fund		53.00	.85
School of theology alumni professorship		4.00	.....
Total for designated purposes		148,010.79	7,028.35
Endowment funds for general purposes:			
As at June 30, 1914	$150,972.42		
Received during the year	25.00		
Law professorship transferred	10,010.00		
		161,007.42	7,170.37
		309,018.21	14,198.72

Endowment funds, with income—Continued.

RECAPITULATION.

Funds.	Principal.	Income.
Students' aid funds	$58,609.60	$3,042.42
Professorship funds	69,723.10	2,997.77
School of medicine funds	15,000.00	750.00
Students' scholarship funds	3,200.00	160.00
Smith textbook fund	500.00	25.00
Hartford reading-room fund	425.00	21.25
Prize debate fund	553.00	26.85
Total for designated purposes	148,010.79	7,028.35

REPORT OF THE SUPERINTENDENT OF THE UNITED STATES CAPITOL BUILDING AND GROUNDS.

REPORT OF THE SUPERINTENDENT UNITED STATES CAPITOL BUILDING AND GROUNDS.

OFFICE OF SUPERINTENDENT
UNITED STATES CAPITOL BUILDING AND GROUNDS,
July 1, 1915.

SIR: In my last annual report reference was made to important improvements, provided for in the acts approved as follows:

Resurfacing plaza, act approved August 1, 1914.

Reconstructing central approaches, act approved August 1, 1914.

Resurfacing terraces of the Capitol, act approved June 23, 1913.

CAPITOL PLAZA.

Since the date of my last report a contract for this work was entered into with the Cranford Paving Co., after competition, based on the specifications of the engineer department, District of Columbia. These specifications so aptly fitted the work, being based on long experience in this class of work, that I felt justified in taking them as a standard, as in 1892, when the last resurfacing was done. Those familiar with this class of work know what is required in the concrete-base work to sustain the surface coat of asphalt. Under the old formation were found curious combinations of base, some composed of clay and broken rock, some of hard clay and pebbles. As the surface was removed it appeared necessary to remove many square yards of this type of base work and replace it with more substantial concrete base.

The old plan of drainage was changed by providing, first, the readjustment of grades for the plaza, roadways, and sewerage entire; second, all borders of the asphalt pavement were provided with suitable brick gutters, properly placed along the curbing, due reference being made to the newly established grades. This necessitated the readjustment of practically all of the curb lines in the grounds, involving recutting of the curb, resetting on concrete base, and a general overhauling. Some new curbing was purchased from the District to take the place of that which could not be used to advantage, owing to injuries or decay.

At the east front of the Capitol Plaza are two plant cases (so called), now transformed into fountains. They flank the north and south sides of the East Capitol Street entrance. On either side are the two roadways, leading northeast and southeast; inclosed by these are the main east lawns, surrounded in somewhat semicircular form. The semicircular formation has a foreground of low wall, a sidewalk in front, and a special type of curb in front of that, bordering the east plaza. This curbing was taken up and reset to new grades and a new sidewalk of cement installed—including that for fountains—doing away with a disagreeable condition existing for years.

In connection with this work new concrete paving has been laid in the recesses between the Senate and House wings and the central building. Up to the date of this report 43,000 square yards of asphalt paving have been laid; 2,550 cubic yards of extra concrete base has been placed; 12,866 linear feet of ordinary curbing has been taken up, recut, provided with concrete base, and reset; 12,866 linear feet of gutter formed of vitrified brick has been installed; and approximately 7,280 square yards of new concrete paving put in place.

CAPITOL GROUNDS.

It must be apparent to everybody that the condition of the Capitol Grounds in general, during the past fiscal year, has been better than for several years. Barring the unfortunate condition of some of the trees, which will require further treatment, the rest of the trees, plantings, and lawns seem to be in excellent condition.

Attention is called to the fact that the settlement of the earth over the railroad tunnel which traverses First Street has caused much inconvenience and expense. It is true that under former arrangements the company repaired the then apparent damages, but in future it will be necessary for this office to readjust walls, copings, etc., along the east side of the Capitol Grounds. In the resurfacing work heretofore referred to it was not possible to approach with safety within 50 feet of eastern limits of the Capitol Grounds.

The underground steam tunnel from the power plant to the Capitol, Library Building, Senate and House Office Buildings has settled, as has the exterior surface lines. How far this will go in the future is hard to judge, but so far the steam and electric supply lines have withstood the change in level in an admirable manner, owing to certain expansion joints properly and originally distributed.

The damage above named extended also to the House Office Building approaches at the corner of First and B Streets. They have already been reset and are again in the course of repair. No fear, however, need be felt for the House Office Building, for the foundations of that structure go down to the bottom of the tunnel foundations and no damage has resulted to the structure from the cause first named.

RECONSTRUCTING CENTRAL APPROACHES.

At the east front of the central section of the Capitol the condition of the steps has been the subject of criticism for years. An appropriation has been made for new steps and a subsequent contract made therefor. At this date the preliminary work has been started and before the meeting of the Grand Army of the Republic, to be held in September, the work will without doubt be completed.

RESURFACING TERRACES OF THE CAPITOL.

At the date of this report the work of waterproofing the Capitol terraces has proceeded to that point where 6,332 square yards of the total of 12,795 square yards stand completed. This work has been most interesting from the engineer's point of view, both as to method and quality of work done.

Some months ago specifications were issued and bids received for this work. After a careful examination of the bids received, it was decided to modify somewhat the preliminary methods and further proposals were asked and received. These were still unsatisfactory. In the course of the examinations, we came across one method which was believed to be the best submitted, although the price was considered much too high. I decided that if I could get permission to use this method, the work would be done directly under the supervision of this office. I came to a satisfactory agreement with the representative of the system desired and immediately proceeded with the work. The whole arrangement has been satisfactory and economical, and more than the contemplated work will be done within the amount set for the purpose.

A brief description might be interesting. Naturally, the important part of any system of waterproofing is the quality of material and method of laying. Having acquired what was considered the best material, the exterior surface of the terrace was removed down to the large expansion joints of the breaks which naturally occur in a structure of that character, These joints having been thoroughly treated with a compound which does not crack under a change of temperature, the structural surface was brought to the level upon which was laid sheets of cotton saturated with the material, all joints being carefully ironed so as to produce a continuous sheet. Upon this surface was laid the ordinary cement pavement which finally forms the walk surface of the exterior. Another important feature of the method used is that it does away with metal flashing. The engineers will understand how important this is. As the pavement was laid expansion joints were left at certain distances, similar joints being laid along the balustrade and at all other places where flashing would have been necessary. After the work was completed, the expansion joints were cleaned out thoroughly, dried, and poured with this special compound, which seems to cling to properly prepared surfaces with remarkable tenacity. The joints are not entirely filled, but sufficient space is left for filling with a weak mixture of cement-pointing material.

GENERAL REPAIRS.

CENTRAL PORTION OF THE CAPITOL.

A new ventilating fan was installed over the ceiling of the Supreme Court chamber. The cellar under the central building has been whitewashed. Experiments have successfully been made in the lighting of the west main entrance to the Capitol by the installation of incandescent electric lamps to take the place of arc lamps. It is proposed to carry this feature of the lighting of the terrace to other points north and south.

SENATE WING OF THE CAPITOL.

New electric-lighting fixtures have been installed in the Senate lobby, Committee on Post Offices and Post Roads, marble room, reception room, and old post-office room. The chandelier in the President's room has been remodeled and refinished.

A thorough cleaning and painting has been given the Senate Chamber and entrances, cloakrooms, corridors, press gallery, restaurant, stairways, skylights, room in crypt, toilets, and rooms of Committee on Rules, and those occupied by the Capitol police. The lavatory at the foot of the Dome stairs has been cleaned and repaired.

All of the elevators have been kept in good repair; new cables have been installed, which, with the introduction of equalizers, makes a saving in the number of feet of cable to be replaced eventually.

Under the provisions of the act of March 2, 1911, the old boilers formerly in service for heating and ventilating in the Senate wing have been transferred to the Bureau of Mines and the Bureau of Standards. A new floor was laid in elevator No. 1, inclosure repaired, the switchboard room repaired, and the switchboard rewired; the commutators for fans No. 2 and the kitchen exhaust fan were reconstructed and new connections made.

HOUSE WING OF THE CAPITOL.

Electric-lighting fixtures were installed in the Speaker's room and in that of the majority leader. The following rooms have been cleaned and painted: House Chamber, cloakrooms, Speaker's rooms, main entrances, Committee on Appropriations, Clerk's office and rooms, restaurant, library station, skylights, and toilets. A new women's toilet and lavatory has been installed in the southeast corner of Statuary Hall.

In the heating and ventilating department of the House wing, the hot-water boilers have been supplied with new steam pipes; new Anderson traps fitted to the steam coils; repairs made to all valves and new ones installed where needed. All of the elevators have been inspected and repaired where necessary and new cables installed. Two of the Babcock and Wilcox boilers formerly used in the electric-lighting plant of the House wing have been, under the authority conferred by Congress, transferred to the Home for Aged and Infirm.

SENATE OFFICE BUILDING.

The copper roofing of the Senate Office Building was damaged by storms to an extent that necessitated much repair work, especially over the dome at the main entrance. The post office of the Senate was permanently transferred from the Capitol to the Senate Office Building and completely furnished and equipped in steel.

The hot-water pipes of the entire heating system were covered with suitable pipe covering. A new equipment of awnings and window shades of the best quality has been installed, and communicating doors were cut between four suites and the necessary jambs, trim, and doors supplied.

HOUSE OFFICE BUILDING.

The general maintenance and repairs to the House Office Building have been kept up satisfactorily. The stone coping of the cornice, which gave some trouble on account of leaks, has been gone over and thoroughly pointed up. Preparations are being made to overhaul

the various rooms and paint them. Congress has made an appropriation for the purpose. The roof has been inspected and repairs made.

THE CAPITOL POWER PLANT.

During the past year the Capitol power plant has been operated with the same degree of efficiency as in former years. The service rendered has been of the highest class, and in all particulars satisfactory, and no serious interruptions to the service on account of breakdowns have occurred.

ENGINE HOUSE, SENATE AND HOUSE STABLES.

A new heating plant, boiler, etc., has been installed in the Senate stable and engine house. The old plant formerly heated only a portion of the engine house and cottage. The new equipment is sufficiently large to take care of all the buildings. New down spouts have been placed on the stable building and new guttering placed on the carriage shed. A new inclosure has been erected for the boiler room; new floors have been constructed in the stalls of the engine house and all other necessary cleaning, painting, and minor repairs

UNITED STATES BOTANIC GARDEN.

During the fiscal year 1915 the activities of the United States Botanic Garden are best shown by the report of the superintendent, which follows:

During the fiscal year 1915 the United States Botanic Garden, by and through the authority of Congress, distributed over 300,000 plants, trees, and shrubs to all parts of the United States. This distribution has grown to such an extent that the garden is handicapped for room and men. Exchanges have been made with various universities and private estates.

Twenty-nine orchids, representing 10 of the best suited varieties for greenhouse growing, were purchased, making the collection one of the most complete in the country. Eight bay trees with crowns 5 feet in diameter were purchased and placed on either side of the walks leading to the Bartholdi Fountain, which add greatly to the general appearance of the garden. Two fine specimens of crotons were purchased and placed on either side of the main entrance. The large palms which are placed on the main walk during the summer months were retubbed and the tubs given two coats of paint.

In August was purchased a motor lawn mower and roller which has proved very satisfactory. This mower is known as the walking model and can be operated among the trees and shrubs with great success. The garden, at the time of this writing, is in excellent shape, better than for a number of years.

The trees and shrubs were given a thorough spraying in the fall and spring.

The room next to the superintendent's office was remodeled and is now used as an office by the shipping department.

New benches were constructed in greenhouses Nos. 2 and 5, south side of Maryland Avenue. The benches in the main conservatory were repaired and put in first-class condition. All necessary glazing, painting, and repairing has been carried on from time to time, under the various appropriations allotted by Congress.

It is gratifying to note the increasing interest of the public in the shrubs, plants, and flowers as well as in the tropical and other plants of rare varieties housed in the different conservatories.

COURTHOUSE, WASHINGTON, D. C.

Considerable painting has been done at the courthouse during the past fiscal year. This work included suites of five of the justices, the marshal's office, register of wills, basement corridors, telephone,

toilet, file, and 40 other rooms in the building, all outside windows and down spouts. Many windows were glazed and floors stained in seven rooms. Repairs have been made to the roof. The elevators, lighting fixtures, and ventilation system were kept in good condition, repairs being made wherever necessary.

SPECIAL SUBJECTS.

ENLARGING CAPITOL GROUNDS.

The problem of enlarging the Capitol Grounds has passed through many phases. The first commission authorized by Congress referred the matter to the Department of Justice, which in turn referred it to the proper court. The court reported on the awards, parts of which were in turn rejected by Congress. Later a special commission was appointed, after the awards as to squares 685 and 634 had previously been approved and paid for. A contract was entered into for the removal of all houses and débris on squares 685 and 634. Owing to the delinquency of the contractor, I was compelled to take possession of the unfinished work and complete it. The expense forced upon the Government will be duly reported and left to the legal procedure of the department under the terms of the contract and bond.

The proceedings of the new commission appointed to acquire the property not otherwise acquired, and outlined under the original act, have enabled the Government to take possession of most, if not all, of squares 721, 722, and 723.

On squares 685 and 634, upon which the delinquent contractor worked, the work of final cleaning up and the rough grading has been practically finished. On square 685, however, there remains standing truck house No. 1, of the District fire department, which, I understand, will be removed next year, as a new site has been selected for it at some near-by point.

Work on squares 721, 722, and 723 has proceeded as fast as the properties were turned over and as fast as was consistent with the conditions of acquisition, due regard being given to properties not already in possession of the Government.

At the date of this report the conditions (excepting squares 685 and 634) are about as follows:

South half of square 721, bounded by First and Second Streets, California Street, and E Street, has 18 houses on it, all of which have been turned over to the Government, with the exception of No. 136 E Street.

Square 722, bounded by Massachusetts Avenue, E Street, First and Second Streets, has 26 houses on it, and all except No. 412 Second Street have been turned over to the Government. Work was started on taking down these houses June 16. Not completed at this date.

Square 723, bounded by D Street, Massachusetts Avenue, First and Second Streets, contains 53 houses, about one-half of which have been turned over to the Government.

COLUMBIA HOSPITAL FOR WOMEN.

This hospital, which was designed to be one of the finest maternity hospitals of the present time, is rapidly approaching completion. In three months it will be ready for occupancy. About the middle of

October, 1914, the main structural walls were completed and the roof was being placed. The heating and ventilating system followed along with the general progress of the work. As soon as structural conditions permitted the construction of the elevators commenced, followed by the installation of the vacuum-cleaning system and laundry apparatus. Details as to installation of other equipment will come in a later report. The interior work, such as terra-cotta partitions, etc., was carried forward in such manner that the building was ready for plastering about December 1. Barring a slight interruption on account of cold weather, this work proceeded with fair speed, especially after the building was inclosed with permanent sash and glazing and the heating plant was put into operation. Installation of the woodwork under the general contract commenced in the early spring and was practically completed by June 30. In the meantime as fast as rooms were ready the sterilizing apparatus in detail was installed.

Painting of the interior commenced in June, and at the date of this report is well under way, with prospects of completion in August.

The following is a list of contracts entered into prior to the date of this report:

Contracts for Columbia Hospital.

Warren F. Brenizer, general excavation, Jan. 12, 1914	$6,200.00
George E. Wyne, general contract for building, Apr. 6, 1914	242,900.00
Ohio Elevator & Machine Co., elevators and dumb-waiters, Sept. 28, 1914	15,000.00
American Sterilizer Co., sterilizng equipment, Mar. 10, 1915	5,479.50
Bramhall, Deane Co., kitchen equipment, Mar. 10, 1915	3,197.00
Dulin & Martin Co. (Inc.), refrigerators, Mar. 10, 1915	3,795.00
American Laundry Machinery Co., laundry equipment, Mar. 26, 1915	5,200.00
Elmer H. Catlin Co., electric lighting fixtures, June 26, 1915	2,765.43

Other special contracts which are to be made and for which specifications have been issued are as follows: Linens and blankets, aseptic furniture, hospital beds, mattresses, etc.; wood furniture for the various rooms and metal screens for the various doors, transoms, and windows.

Several other features which are most important to the work and success of this hospital are at present under consideration. The instrumental and pharmaceutical equipment has been the source of much study. Realizing that this office had no person equipped by experience in matters of this character I called upon Messrs. Mechlin & Starr, engineers, and Drs. Truman Abbe and Davenport White, all of this city, for advice as to the proper obstetrical and gynecological instrumental outfit and the proper source of purchase, considering at all times the interests of the Government. These gentlemen have faithfully performed their duty, and negotiations are now under way which will complete their work, and the contracts will shortly be made.

The usual financial statement follows.

Respectfully,

ELLIOTT WOODS,
Superintendent United States Capitol Building and Grounds.

The SECRETARY OF THE INTERIOR.

EXPENDITURES.

Capitol Building and repairs, 1915.

Pay rolls and labor vouchers		$19,899.84
Machinery and ironwork		424.69
Brushes, sponges, soap, etc		649.50
Lumber and millwork		342.99
Hardware		1,384.64
Lime, brick, cement, and sand		89.35
Paint, oil, and glass		1,718.48
Legislative bell service		281.66
Drawing and photo materials, blue prints, etc		164.55
New office vehicle, etc		4,790.84
Hauling, telegrams, and express		9.61
Plumbing and plumbing material		2,286.03
Elevators and repairs		229.44
Roofing and tinwork		195.34
Tile and tiling		78.13
Repairs to ranges, etc		279.00
Stationary, books, etc		171.50
Flags		73.95
Miscellaneaus		143.67
Amount reserved for unpaid bills		1,786.79
		35,000.00
Appropriated:		
Sundry civil bill, Aug. 1, 1914	$30,000.00	
Deficiency bill, Mar. 4, 1915	5,000.00	
		35,000.00

Improving Capitol Grounds, 1915.

Pay rolls and pay vouchers	$23,610.60
Plants and seeds	963.90
Fertilizers	1,649.15
Tools and machinery	202.87
Brushes, brooms, etc	407.40
Soil and sod	54.00
Motor and hand mowers	1,286.98
Cement, sand, etc	45.16
Plumbing and materials	4.79
Hardware	31.02
Paving and repairs	181.06
Hauling, freight, etc	31.13
Hose and couplings	685.25
Lumber	77.26
Trees, etc	244.36
Travel expenses	4.25
Repairs to fountain, etc	261.84
Miscellaneous	35.44
Reserved for unpaid bills	223.54
	30,000.00
Appropriated, sundry civil bill, Aug. 1, 1914	30,000.00

Engine house, Senate and House stables, 1915.

Pay rolls and pay vouchers	$281.90
Lumber and millwork	491.77
Roofing repairs and tinwork	47.16
Hardware	34.90
Paint, oil, and glass	84.10
Repairs to boilers, etc	557.66
Reserved for unpaid bills	2.42
	1,500.00
Appropriated, sundry civil bill, approved Aug. 1, 1914	1,500.00

United States courthouse, District of Columbia, 1915.

Pay rolls and vouchers	$3,540.91
Lumber and millwork	241.29
Paint, oil, and glass	705.38
Roofing	4.85
Hardware	41.55
Brick, sand, and cement	159.03
Plumbing and plumbing material	301.97
Balance	5.02
	5,000.00
Appropriated, sundry civil bill, Aug. 1, 1914	5,000.00

Capitol power plant, 1915.

Pay rolls and vouchers	$69,729.59
Office supplies and expenses	34.24
Power-plant building	181.77
Miscellaneous power-plant equipment	1,160.59
Turbines and motor generators	607.41
Switchboards and equipment	60.62
Boilers and stokers	3,782.23
Coal and ash handling equipment	96.13
Miscellaneous steam equipment	1,415.89
Storage-battery equipment	1.47
Pumping station and waterways	2,289.58
Steam transmission and tunnels	895.30
Electric transmission, ducts, etc	2,441.01
Electric apparatus and accessories	237.90
Wire and material	4,777.68
Fixtures	4,446.70
Incandescent and arc lamps	6,508.77
Hauling, express, telegrams	3.62
Gas and electric current	768.13
Fuel, oil, and waste	66,791.38
Advertising	129.95
Reserved for unpaid bills	8,940.04
	175,300.00
Appropriated, sundry civil bill, Aug. 1, 1914	175,300.00

House Office Building, maintenance, 1915.

Pay rolls	$41,142.69
Brushes, soap, and sponges	996.48
Lumber and millwork	205.37
Paint, oil, and glass	281.14
Plumbing and repairs	125.02
Hardware	387.51
Contingent	717.94
Water	.50
Repairs, machinery, and elevators	1,317.32
Tin and roof work	158.50
Awnings and repairs	213.50
Stationery and books	4.20
Reserved for unpaid bills	161.83
	45,712.00
Appropriated, sundry civil act approved Aug. 1, 1914	45,712.00

Senate Office Building, maintenance, 1915.

Pay rolls	$52,125.53
Brushes, soap, and sponges	580.30
Lumber and millwork	52.10
Paint, oil, and glass	10,126.68

Plumbing and repairs		$1.41
Hardware		146.46
Ice		425.00
Contingent		294.88
Water		69.75
Repairs, machinery, and elevators		735.19
Tin and roof work		460.65
Repairs, subway cars		290.57
Reserved for unpaid bills		2,991.48
		68,300.00
Appropriated:		
Sundry civil act, approved Aug. 1, 1914	$55,000	
Deficiency act, approved Mar. 4, 1915	13,300	
		68,300.00

REPORT OF THE GENERAL SUPERINTENDENT AND LANDSCAPE ENGINEER OF NATIONAL PARKS.

REPORT OF THE GENERAL SUPERINTENDENT AND LANDSCAPE GARDENER.

DEPARTMENT OF THE INTERIOR,
OFFICE OF GENERAL SUPERINTENDENT AND
LANDSCAPE ENGINEER OF NATIONAL PARKS,
San Francisco, Cal., Monadnock Building.

SIR: The work in this office during the first year of its life has brought into strong relief the need of further study of the problems involved in the administration of our national parks. There is a growing feeling that our scenic areas, and particularly those which have been set aside as national parks, have not received the attention which their importance as a factor in both the economic and aesthetic development of our country would seem to justify. This is evidenced by the marked increase in the attention paid by the press to the affairs of our parks and by the apparent desire on the part of the public to know more of them and the particular part they play in the life of the Nation.

That the expenditure of money for the maintenance and development of our scenic reservations has an economic as well as aesthetic justification there can be no doubt, for each year large sums of money have left this country to be spent by tourists in foreign lands in search of scenic beauty. The fact that no material proportion of this sum returns is only less provoking than the knowledge that the money thus taken abroad by Americans is spent to view natural attractions that are inferior to those which may be found at home. In your report of 1913 you stated that land is not always land, but is sometimes coal, sometimes timber. One might add that it is sometimes scenery and, as such, merits the careful study and development that would be extended to other national resources.

The condition of travel in foreign lands has stimulated the interest of our people in the merits of similar pleasures in this country. Never in history has there been so great a volume of travel in the United States. Surely it is the part of wisdom to retain this great advantage and to crystalize upon a general policy for the administration of our national parks.

FUNCTIONS OF OUR NATIONAL PARKS.

The first step in the consideration of a general policy for the administration of the national parks is the determination of just what functions they perform. Clearly they are not designated solely for the purpose of supplying recreation grounds. The fostering of recreation purely as such is more properly the function of the city, county, and State parks, and there should be a clear distinction between the character of such parks and national parks. The latter

should constitute a class that is of national interest. In the category of national parks should be no reservation that is of local interest only. What, then, are the functions of our national parks as distinguished from State and local parks? As I view this question our national parks should serve three distinct functions:

1. The stimulating of national patriotism.
2. The furthering of knowledge and health.
3. The diverting of tourist travel to the scenic areas of the United States.

NATIONAL PATRIOTISM.

We, as a people, have been accused of lacking in that love of country with which our neighbors in Europe are so plentifully blessed. Whether such a criticism is merited or not, it is certain that local patriotism has rapidly grown in this country more or less at the expense of patriotism for the country as a whole. This condition would not exist if our people knew their country.

To love a thing one must know it. The Belgian knows each hill and dale of his small country and loves it with an intensity that has become proverbial. And so it is with the Swiss, the French, the English. These peoples know their lands and love them. But ours is a great country, stretching from sea to sea, and a knowledge of all its glories is given to but few. What more noble purpose could our national parks serve than to become the instrument by which the people shall be lured into the far corners of their land that they may learn to love it? For one who will encompass the circuit of our parks, passing over the great mesas of Colorado, crossing the painted desert, threading the sparkling Sierra Nevada, and viewing the glaciers and snow-capped peaks of the great Northwest will surely return with a burning determination to love and work for, and if necessary to fight for and die for the glorious land which is his.

KNOWLEDGE AND HEALTH.

I have said that it is my opinion the Federal Government is not justified in maintaining a national park for recreation purposes alone, yet it is readily seen from the character of our reservations that each has its recreational feature. I do believe, however, that objects and districts of great educational value should be reserved and placed in the category of national parks. Natural phenomena, great canyons, ruins of antiquity, waterfalls—all are objects of great interest and possess an educational value that can not be estimated.

In Yellowstone are the geysers, in Yosemite the highest of waterfalls, in Sequoia the largest and oldest trees on earth, trees that were 3,000 years old when Christ was born. In Wind Cave National Park is a cave that comprises over 90 miles of sparkling passages. At Arkansas Hot Springs and Platt National Park are medicinal waters that have dispelled the pain of legions of sufferers. In Mesa Verde National Park are the crumbling dwellings of a forgotten race.

Pregnant with mystery and romance, these ancient ruins beckon the traveler across the great green mesa and cast about him the spell of endless conjecture. If for no other reason, the value of these treasures as a medium for the furthering of knowledge and health

fully justifies the plea for further aid, both moral and financial, from our Federal Government.

If this aid is granted and a systematic effort is put forth to send our people out into the hinterland of this country, we shall be confronted by the problem of caring for a flood of tourists whose needs must be anticipated.

THE TOURIST.

The first logical step to be taken in an analysis of the conditions of tourist travel is a study of the tourist himself. Primarily, the tourist takes the line of least resistance. This means that he seeks the path that presents the best accommodations for the least cost. From a record of travel in our parks it may be shown that the finest scenery without accommodations will not receive so large a travel as an inferior character of scenery which has a better type of accommodation.

The tourist who upon the strength of literature issued by the department travels to our parks is more or less justified in holding the Federal Government responsible for his comforts or discomforts while there. Nor is he backward with criticism. He demands that he be instructed as to the merits of this trail or that, this camp or that. He not infrequently is disappointed in not finding luxuries that he would not expect in similar places under other than Federal control. He invariably overlooks the fact that he, in a way, is part of the Government, and therefore indirectly responsible for the conditions he finds. Nevertheless, his demands must be respected if it is hoped to direct his footsteps to travel in our country.

The three potent factors in influencing tourist travel are publicity, accommodations, and transportation. Obviously, the tourist must be informed of the merits of the district to which it is desired to bring him. He must then be shown that the accommodations at that place are satisfactory; and, last, he must know that the transportation facilities to, through, and from the location are good and may be had at reasonable cost. These three factors should constantly be borne in mind in any planning for the development of tourist travel.

The three general classes of tourists who visit our parks are: Those to whom the expense is of little moment; those who, in moderate financial circumstances, travel in comfort but dispense with luxuries; and, third, those who, fired with the love of God's out-of-doors, save their pennies in anticipation of the day when they may feast their eyes upon the eternal expanse of snow-clad peaks and azure skies. It is of this latter class that I would speak.

Many of our parks are truly vast in area, encompassing within their boundaries innumerable wonders. To reach these the tourist, upon arriving at the park, must hire saddle animals, pack animals, a guide, cook, and other help. The expense of such an outfit is prohibitive to all but the wealthy. Those who have waited and saved their money are denied the fuller enjoyment of our parks, for they can not bear the expense of transporting their supplies over the trails. There is but one solution of the problem of caring for this class of tourists, and that is the establishment of small inns at convenient intervals, so that tourists may travel the trails afoot, purchasing their provisions and other necessities as they go. As you are aware, the first

steps in an effort to bring about such a condition have been taken in Yosemite National Park. If this work is carried through, a blessing will have been conferred upon those whose lack of money has shut them from the greater part of our national parks. It will also be, in my opinion, the most potent factor in retaining, through the medium of our parks, a material percentage of tourist travel and will necessitate a careful consideration of the problem of a general policy.

Any plan, however, which may be devised for the management of our national parks should not be predicated upon the assumption that their function is solely to accommodate and retain our tourists in this country.

A GENERAL POLICY.

A policy to be efficient must be functional. One for the parks, therefore, must take into consideration the distinctive characteristics of national parks which, as before stated, are relative to the furthering of a national patriotism, public knowledge and health, and tourist travel in the home land. Upon consideration it will be seen that the first two follow as a natural consequence of the last. In the consideration of a general policy we are concerned primarily, therefore, with tourist travel.

To foster tourist travel it will be necessary to develop the roads, trails, and other accommodations in the parks to a point where the traveler will not be subjected to serious discomfort. This means the expenditure of money upon a larger scale than has been the practice heretofore, and the first question that should be settled is, What shall be the source of supply?

There are but two practical sources from which funds may be secured, namely, by Federal appropriation and by revenues from the parks themselves. Both resources are now resorted to, each of which is inadequate. If the Federal Government is to support the parks, then they should be operated so as to make the cost to the tourist as low as possible. If not, then the various sources in the parks themselves should be developed sufficiently to supply the needed money.

The sources of revenue from the parks fall into four classes:

1. Automobile permits.
2. Concessions of various kinds.
3. Receipts from public utilities operated by the Government, such as light, telephone, etc.
4. Natural resources, such as timber, stone, fuel, etc.

Of these four sources it will be seen that they may all be classified as taxes in proportion to the benefit received rather than the ability to pay. An analysis of this character may help in the decision of the policy to be pursued, but it can do no more. The decision must be made in the light of public needs, and the park supervisors should know whether they are to develop the park revenues to their maximum, or whether the park is to be administered at the lowest possible cost to the tourist.

If the question of finances were settled, in so far as the source is concerned, and a well-crystalized policy, looking toward the development of the parks along lines that will foster the increase of tourist travel in this country, is established, much of the delay and confusion in the field will be eliminated.

WHAT HAS BEEN ACCOMPLISHED.

The work in this office has been distributed among the parks, giving attention where it seemed to be most needed.

One of the first steps taken after the creation of this office was the laying out of organization charts for the office of the general superintendent and a typical organization chart for the Yosemite National Park. Three charts were drawn—one for the office of the general superintendent, one organization chart for the Yosemite National Park, and a functional organization chart making a complete and detailed analysis of the functions of the various officers in Yosemite National Park.

INSTALLATION OF COST-KEEPING SYSTEM IN YOSEMITE NATIONAL PARK.

With these organization charts well in mind, a system was devised which will enable the department to keep a close and accurate record of the operations in the parks where the system was adopted. This system was installed in the Yosemite National Park, and the records and information shown in the monthly reports therefrom enable this office to make many material reductions in the cost of operation. For example, the report of May, 1915, showed a cost of $1.66 per mile for sprinkling roads. The analysis given in the report enabled us to find the leaks and losses, and the monthly report for August, 1915, after repairs had been made to the sprinkling system, showed a cost of 72 cents per mile for sprinkling roads. Similar reductions were made possible in other departments.

This system of cost keeping comprises two general divisions, namely, statistical reports and financial reports. Copies of the monthly reports are forwarded to the department, showing clearly the operations of the month.

Before this system could be installed it was necessary to take an inventory of the physical assets, such as buildings, bridges, power plant, materials on hand, etc. This inventory was made, and disclosed the astounding fact that there were in the Yosemite National Park on April 30, 1915, $23,625.34 represented by materials and supplies on hand. The inventory further showed that the assets in the park in the form of construction work done, utilities, etc., amounted to $613,635.03, apportioned in the following manner:

Construction work, such as trails, bridges, culverts, etc	$453,923.15
Public utilities operated by the department, such as electric system, telephone system, etc	96,601.75
Equipment, comprising live stock, wagons, machinery, etc	36,434.29
Inventories, comprising materials and supplies, forage, etc	23,625.34
Accounts receivable, cash on hand, etc	3,050.50
	613,635.03

The items that go to make up this inventory are segregated, showing fully what has been expended on each piece of work, and it is proposed hereafter to keep a record so that the department will have on file the amount of money spent on each road, trail, bridge, and every other feature in the park that demands an expenditure of money. It is considered that only in this way will it be possible to carefully

check the expenditures. Further than this, it is only by resorting to a unit cost-keeping system that the department will be able to segregate accurately the moneys for maintenance from those expended for improvements and betterments.

PURCHASE OF SUPPLIES.

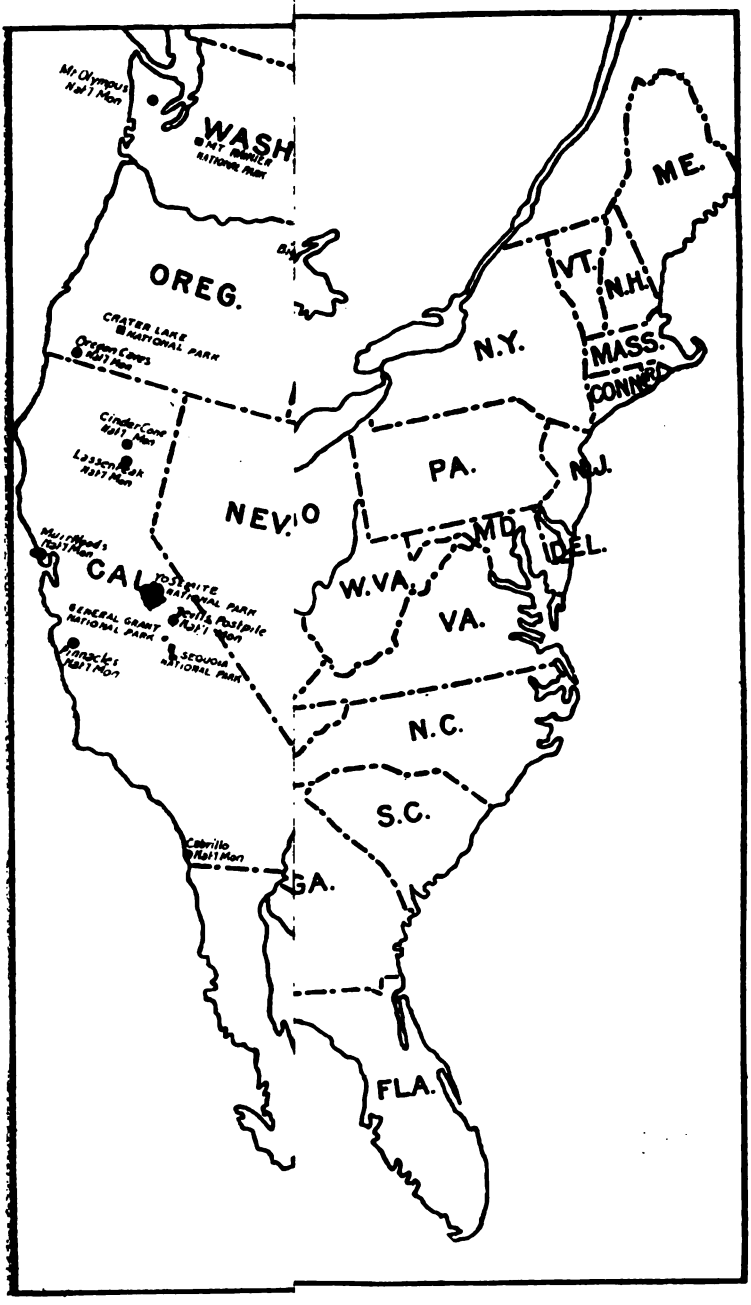
This office, since the 1st of April, 1915, has been purchasing all supplies for Yosemite and Sequoia National Parks and for the other parks where it was practicable to do so. It was found that a better quality of goods could be obtained and a better price could be had by making a personal inspection of the supplies purposed to be furnished.

It has been the custom in the past for the local supervisor or superintendent to purchase the supplies direct. The parks are so situated that they are usually quite a distance from a market, and this custom resulted in loss of time in sending proposals back and forth. When the goods arrived, they were often found to be of inferior quality and not exactly what the supervisor or superintendent desired. San Francisco has a factory representative of practically every line of manufacture in this country, and the purchase of supplies for the national parks can be done here on the same basis as though the purchasing agent visited each factory and made a personal investigation of samples of the supplies to be furnished. Shipping these supplies over bond-aided railroads to the various parks places the local dealers in the vicinity of the parks (who have heretofore had this business) in direct competition with the manufacturers and wholesale dealers of supplies required in the operation of the parks. This new system of purchasing from this office from factory representatives and wholesale dealers has resulted in a great saving to the department.

The superintendent or supervisor of each park makes a requisition on this office for material and supplies that he desires purchased. This office then submits proposals to the various dealers, makes personal inspection of the goods to be supplied, and makes the award, whereupon the supplies are shipped to the park, thereby saving a great deal of time as well as money.

IMPROVEMENT IN TRANSPORTATION, YOSEMITE NATIONAL PARK.

Starting on June 1, 1915, the Yosemite Stage & Turnpike Co. placed in operation between the Mariposa Grove of Big Trees and the village of the Yosemite Valley an automobile service for the transportation of tourists between these points. This service replaced the old horse-drawn stages, which were uncomfortable and slow, requiring at least four hours and a half between Yosemite Village and the Wawona Hotel and an additional hour and a half between the Wawona Hotel and the Mariposa Grove of Big Trees, and with this service it was not possible for tourists to go from the village in the valley to the Mariposa Grove without stopping at least one night at the Wawona Hotel. The new service provided a schedule that enabled the tourists to leave the valley in the morning and spend one hour and a half at the Mariposa Grove and return to the valley in the evening in time for 6 o'clock dinner.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Lassen Peak Nat'l Mon
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Sequoia National Park
Pinnacles Nat'l Mon
Carrillo Nat'l Mon
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This service has proven very satisfactory to the traveling public, especially the summer just past, as it would have been a physical impossibility to handle the volume of travel that went over this road with the old horse-drawn stages.

ACQUISITION OF ROADS.

The department has acquired title to that portion of the Tioga Road lying within Yosemite National Park. This road has been rehabilitated this summer and was formally opened on the 28th of July to the public. The opening of this road makes accessible that portion of the park known as the High Sierras and has opened up a section that is extremely beautiful and traverses the park in an easterly and westerly direction. The department's acquiring the Tioga Road has met with great public favor, and when same has been put in good condition it will be the most popular pass for transcontinental tourists through the Sierra Nevada Mountains, as well as being a favorite trip for local automobiles.

The department has also acquired title to that portion of the Big Oak Flat Road lying within Yosemite National Park, and improvement of same is now in progress. In the past this road has been operated by private owners as a toll road. Its acquisition by the Government makes this a free road and is one of the shortest and most practical, as well as being one of the easiest grades, of any road entering Yosemite Valley.

ROAD AND TRAIL MAPS.

During the year 1914 a topography map was started by the surveyors from the Office of Public Roads of the Agricultural Department, under the charge of Mr. T. Warren Allen, showing the topographical conditions on a section of the floor of Yosemite Valley. This survey was made so as to show buildings, trails, roads, and bridges on a scale that could be used for working drawings in planning further improvements. This map was compiled in this office.

It became evident during the first days of the life of this office that a comprehensive plan for the road and trail development of all of the national parks was an essential, to the end that the habit of building disconnected bits of roads and trails might be stopped. Plans for the complete road and trail systems for each of the five national parks were then drawn in preliminary form. The parks thus covered were Yosemite, Crater Lake, Rainier, Glacier, and Sequoia.

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Using the topographic map above referred to, an exhaustive study was made of conditions on the floor of Yosemite Valley with the intention of relieving the congested condition around the present village. As a result, three plans were drawn in the course of the studies made.

In addition to the village plan, studies were made for the new hotel to be constructed on the floor of the valley. Plans were also drawn for the new hotel to be constructed at Glacier Point, together with tentative studies for 12 village buildings.

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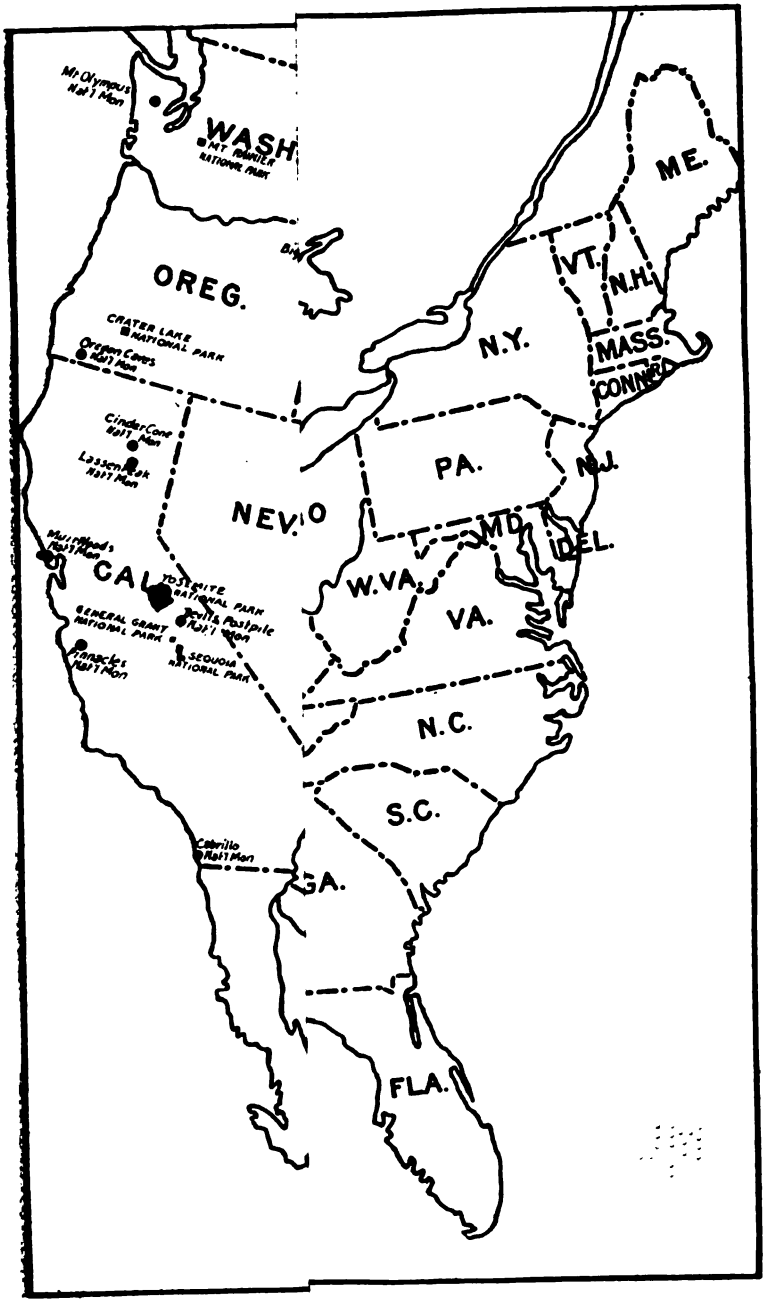
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In addition to the village plan, studies were made for the new hotel to be constructed on the floor of the valley. Plans were also drawn for the new hotel to be constructed at Glacier Point, together with tentative studies for 12 village buildings.

In conjunction with the work done on the replanning of the village, an entire new plan of operation for the concessions in Yosemite National Park was considered. This plan contemplated the granting of a concession to a large operator who would build a hotel of sufficient size to accommodate the demands on the floor of the valley, a smaller hotel at Glacier Point, and 15 mountain inns in the High Sierra in the park, to be built at the rate of three inns each year. Several attempts have been made in the past to secure a concessionaire who would perform this service, but all had been unsuccessful, due to the fact that certain terms could not be agreed upon. The terms considered in this plan were on a profit-sharing basis, the concessionaire under the terms of this arrangement to receive a permit of 20 years' duration and to share the net profits of his concession with the Federal Government. This plan of sharing profits will overcome the difficulty of establishing a graduated scale of charges, thereby making it possible to grant a long-term permit.

With a large hotel on the floor of the valley, a new one on Glacier Point, and a chain of mountain inns throughout the park so spaced that they will be within easy walking distance of one another, it will be possible for those of small financial means to see the entire park to an extent that is now denied them.

In addition to this, the adoption of the village plan will do away with the unsightly buildings that now mar the scenery and will establish a village properly planned, comprising buildings of carefully studied architecture.

The above paragraphs have dealt with work originating in this office. The remainder of the work done in this office will be segregated under the headings of the parks for which the work was done.

YOSEMITE NATIONAL PARK.

In addition to the work above outlined, plans and specifications for the new El Capitan Bridge over the Merced River were prepared in this office, and the bridge constructed under contract for the sum of $2,965.

Plans were also drawn for a new bridge over the Merced River in the vicinity of the present village, which plans are now being considered by bidders.

Plans and specifications were drawn for ranger cabins in the Yosemite National Park, three of which were built at a total cost of $2,990.

In December, 1914, new regulations for the park ranger force were drawn and promulgated by the Secretary. In conformance with these regulations a uniform was designed and insignia of the officers selected. The park rangers in Yosemite National Park are now uniformed according to regulation, and the organization of the park ranger force under the new regulations has been perfected and has demonstrated the merits of the steps taken.

CRATER LAKE NATIONAL PARK.

Plans were begun on the new village for Crater Lake National Park in the year 1915. The work done under this plan comprised studies in architectural character, together with an investigation of

the most feasible method of laying out roads for the circulation of traffic.

In addition to this work, a tour of inspection was made, together with a study of the road and trail system in this park.

MESA VERDE NATIONAL PARK.

A tour of inspection was made of this park in the late summer of 1914, and the needs of roads, trails, and other developments carefully considered. Plans and specifications were drawn for a ranger cabin to be built of stone in the vicinity of the ruins of Spruce Tree House.

GLACIER NATIONAL PARK.

The work in this office on this park has been confined to the purchasing of materials and planning of the road and trail system which followed as a result of a more or less prolonged inspection of the park.

SEQUOIA NATIONAL PARK.

Trips of investigation have been made to Sequoia National Park, and a system of roads and trails planned. A survey has also been made (finished in June, 1915) of the Mineral King Road, which traverses the park, together with a survey and location of the proposed changes necessary to make this road practical and passable to motor-propelled and other vehicles.

RECOMMENDATIONS

AS TO THE OFFICE OF THE GENERAL SUPERINTENDENT AND LANDSCAPE ENGINEER OF NATIONAL PARKS.

The following recommendations are based upon the assumption that it is the Secretary's desire to hold the general superintendent and landscape engineer responsible for the work in the national parks and that the general superintendent should in turn hold the officers in the parks responsible to him.

The general superintendent should have the authority to employ or dismiss any men in the service, and that suspension should remain effective until revoked by the Secretary.

Allotments from the annual appropriations should be made in the general supperintendent's office after a general plan for the expenditure of money has been submitted to the Secretary and approved.

I recommend that the general superintendent be given authority to enter into contracts for construction work as well as for the purchase of materials by contract in accordance with the general scheme of expenditures approved by the Secretary.

This office has purchased all supplies for Yosemite, Sequoia, and General Grant National Parks since April 1, 1915. Considerable saving has been accomplished by purchasing in San Francisco rather than through local dealers in the neighborhood of the parks. Some purchasing has also been done for other parks west of the Rocky Mountains, and in some instances from 15 to 25 per cent has been saved. I recommend that this system of purchasing and the forms

used be adopted and the practice extended throughout the various parks wherever practicable.

In order that the general superintendent may be thoroughly familiar with the phases of the work for which he is held responsible, it is my opinion that correspondence from the parks should be addressed to the general superintendent, or through him to the Secretary, and, likewise, all communications that have to do with operations in the parks should be forwarded from the department through the general superintendent to the parks.

I recommend that all regulations and instructions to be enforced in the parks be promulgated from the general superintendent's office.

It is impossible to accomplish economical management of the parks without the aid of a practical working unit cost-keeping system. Such a system has been installed in the Yosemite National Park and is producing most satisfactory results. I recommend that this system be extended to each and every other national park. This will involve the taking of an inventory on the physical assets in each park such as was taken in Yosemite. This work should also be carried on in other parks.

The title of general superintendent and landscape engineer of national parks carries with it two distinct and separate classes of duties. There is sufficient work under each of these two titles to keep one man very busy throughout the year. It is not humanly possible for one man to act in the capacity of general superintendent and landscape engineer and perform the duties that each of these two titles require. I recommend, therefore, that the title be split and two officers appointed for this work—a general superintendent and a landscape engineer.

Perhaps the most important work that can be carried on in this office is the planning of improvements in the various parks, and I strongly urge that the work that has begun in the way of planning new villages for the Yosemite and Crater Lake National Parks be continued in the remaining parks where such work is needed.

Several attempts have been made to establish by an act of Congress a national park service, and there can be no doubt in the minds of those who are familiar with the problems of administering our national parks that such a service is seriously needed. I would urge that every effort be made to secure the enactment of a law that will establish the national park service on a firm footing.

The title of superintendent in any national park should be dispensed with and a title of supervisor should indicate the officer in immediate charge of the park, as the title of superintendent is confusing with the title of general superintendent.

RECOMMENDATIONS FOR THE VARIOUS PARKS.

YOSEMITE NATIONAL PARK.

The steps that have been taken for the erection of the new hotel on the floor of the valley and another at Glacier Point, and a chain of mountain inns throughout the park, will undoubtedly bring a materially increased travel. To prepare for this, more road and trail construction work in the park is necessary. The road from El Portal

to the valley should be widened and properly surfaced. The road on the north side of the valley from Pohona Bridge to the new hotel site should be surfaced. That portion of the road on the south side of the valley which is now a dirt road should be surfaced. A new bridge should be erected in place of the present Sentinel Bridge, which has several times been condemned and which is now not strong enough to carry passenger trucks.

When the village on the north side of the river is completed it will be necessary to erect new barns and headquarters for the Government employees and stock. There is also a crying need for a new administrative building. The old building occupied at present by the superintendent is insanitary and rapidly falling to pieces.

It is recommended that three motor-driven power sprinkling trucks be purchased for use in sprinkling the roads in Yosemite National Park, as the cost of sprinkling the roads in this park by horse-drawn sprinklers is entirely too high. For the months of May, June, July, and August, 1915, 6,162 miles of roads were sprinkled in this park, at an average cost of 93 cents per mile. The reason for this apparent high cost is that horse hire and forage for the subsistence of stock is very high. The average cost per horse-day for the months of May, June, July, and August was $1.07. By installing motor-driven sprinkling trucks and making some slight improvements in the water system this expense could be reduced 50 per cent.

The purchase of the Tioga Road has widened the activities of the park ranger force, and this force should be augmented to control the travel.

The park rangers in the Yosemite Park have no headquarters of their own in the valley. A ranger barrack should be erected, in which will be lockers for each ranger. A stable should be constructed in conjunction with the barrack where the park rangers called to the valley for special duty may stable and feed their horses.

An information bureau has been in operation for a few months during the season of 1915 and has met with enthusiastic approval on the part of the public. This bureau gives information direct to the tourists regarding the condition of the roads, trails, and all other information desired in a way that is not biased by local prejudice. I strongly urge that a system of local information bureaus operated by the department be adopted in all of the parks and continued in Yosemite National Park.

A collection of stuffed birds and animals indigenous to the area covered by Yosemite National Park has been started, and the same is being placed on exhibition in the bureau of information. The exhibits are supplied through Dr. Joseph Grinnell, director of the museum of vertebrate zoology of the University of California. Some of the park rangers have been instructed by Dr. Grinnell and his assistants in the securing and stuffing of the birds and animals. The work done to date has aroused considerable public interest and has met with enthusiastic appreciation.

A collection of wild flowers is also being completed and placed on exhibition. With each flower is a water-color drawing showing the true color of the flower. This work is being carried on through the park ranger force and the bureau of information.

SEQUOIA NATIONAL PARK.

The Mineral King Road, which traverses the Sequoia National Park from the western boundary to the eastern boundary, connects the San Joaquin Valley with a small summer resort named Mineral King. There is urgent demand on the part of the public to use this road, which use has been denied them. I recommend that the department put this road in shape for travel at the earliest possible date.

The Mount Whitney Power Co. has built a road up the canyon of the Middle Fork of the Kaweah. Surveys for the extension of this road should be made so that it may connect with the Giant Forest Road, thus forming a loop in the park. Another survey of a road connecting Sequoia Park with General Grant Park has been made by the Office of Public Roads. This survey should be considered and, if accepted, adopted and plans for its construction undertaken.

To the east of Sequoia National Park is some of the finest mountain scenery in the world. The area in which the scenery lies is of little or no value for purposes other than the pleasure of scenery lovers. It contains the great Kern Canyon, Kings River Canyons, and Mount Whitney, the highest peak in the United States, together with almost innumerable other features. I can not recommend too strongly that the Sequoia National Park be enlarged to take in the areas to the southeast and east which contain these examples of wonderful mountain scenery.

CRATER LAKE NATIONAL PARK.

The present headquarters of the superintendent are at a point a thousand feet below the rim of the crater. The location is not satisfactory. Plans should be made for a secondary summer headquarters on the rim of the crater, either at the location of the present hotel or at some other point on the rim.

The ranger force in this park is not of sufficient size to adequately protect the park in the winter. The force should, therefore, be augmented to prevent poaching.

A trail should be built as near to the water's edge as possible and as far around the lake as practicability will allow.

Ranger cabins in the form of automobile-checking stations should be erected at each roadway entrance to the park.

The patrolling of this park is rather difficult, as it is in all parks, and in order that the superintendent may perform his duties effectively he should be furnished with an inexpensive automobile.

MOUNT RAINIER NATIONAL PARK.

The entire stretch of road in this park from the park entrance to Paradise Valley should be surfaced with crushed rock.

A survey of the entire road and trail system as outlined on the roads and trails map executed in this office should be made and the feasibility of following out the plans indicated should be investigated. Steps should be taken at once for the development of an encircling road around Mount Rainier and all construction work should be confined to portions of the general plan.

The village at Longmire Springs is particularly unsightly, and steps should be taken to either clean this place and bring about a more harmonious architectural scheme or the site should be abandoned and another one established. The plans for extensions of the trail system as recommended by the supervisor in his report should be adopted.

Tourists climbing the mountain are frequently overcome with fatigue before they reach the summit and are forced to stop over en route. A small comfort station should be erected along the trail to accommodate such people.

Satisfactory headquarters for department officials should be erected in the village and the park rangers in this park should be uniformed according to regulations.

GLACIER NATIONAL PARK.

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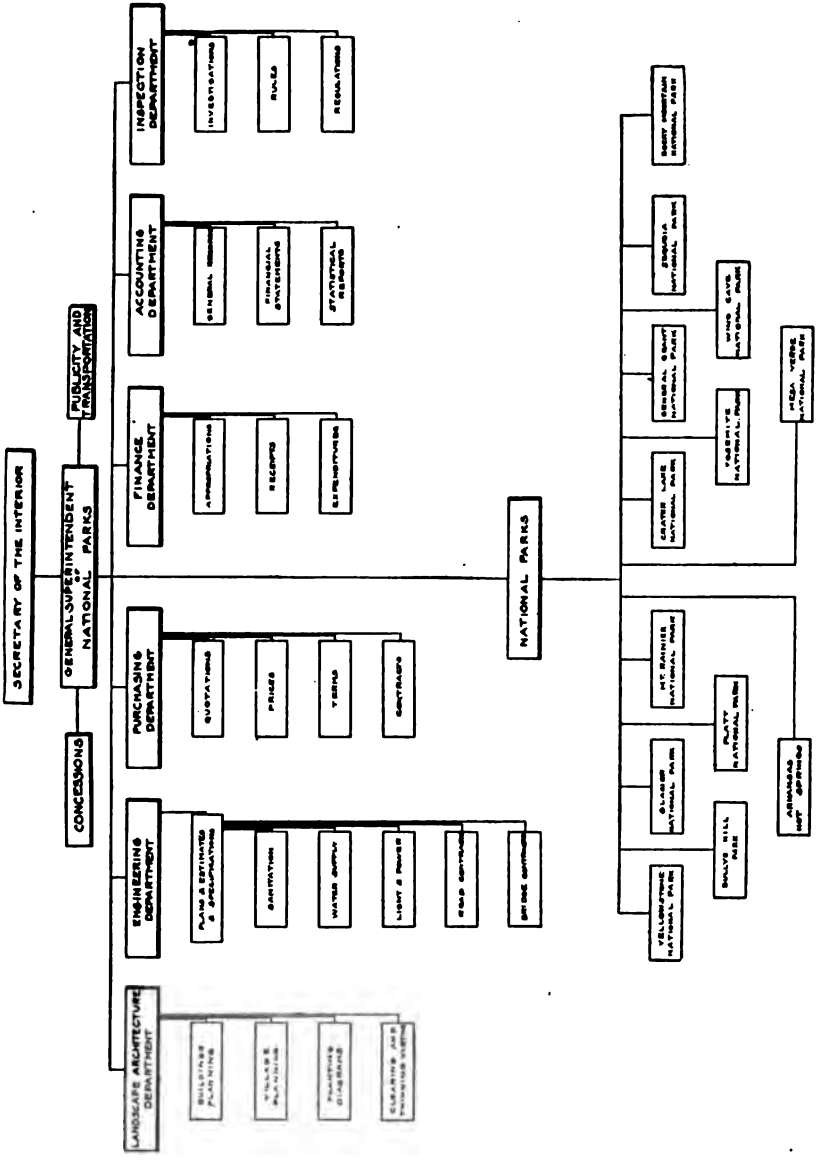

Suggested organisation for supervision of national parks.

This service has proven very satisfactory to the traveling public, especially the summer just past, as it would have been a physical impossibility to handle the volume of travel that went over this road with the old horse-drawn stages.

ACQUISITION OF ROADS.

The department has acquired title to that portion of the Tioga Road lying within Yosemite National Park. This road has been rehabilitated this summer and was formally opened on the 28th of July to the public. The opening of this road makes accessible that portion of the park known as the High Sierras and has opened up a section that is extremely beautiful and traverses the park in an easterly and westerly direction. The department's acquiring the Tioga Road has met with great public favor, and when same has been put in good condition it will be the most popular pass for transcontinental tourists through the Sierra Nevada Mountains, as well as being a favorite trip for local automobiles.

The department has also acquired title to that portion of the Big Oak Flat Road lying within Yosemite National Park, and improvement of same is now in progress. In the past this road has been operated by private owners as a toll road. Its acquisition by the Government makes this a free road and is one of the shortest and most practical, as well as being one of the easiest grades, of any road entering Yosemite Valley.

ROAD AND TRAIL MAPS.

During the year 1914 a topography map was started by the surveyors from the Office of Public Roads of the Agricultural Department, under the charge of Mr. T. Warren Allen, showing the topographical conditions on a section of the floor of Yosemite Valley. This survey was made so as to show buildings, trails, roads, and bridges on a scale that could be used for working drawings in planning further improvements. This map was compiled in this office.

It became evident during the first days of the life of this office that a comprehensive plan for the road and trail development of all of the national parks was an essential, to the end that the habit of building disconnected bits of roads and trails might be stopped. Plans for the complete road and trail systems for each of the five national parks were then drawn in preliminary form. The parks thus covered were Yosemite, Crater Lake, Rainier, Glacier, and Sequoia.

THE VILLAGE PLAN FOR YOSEMITE.

Using the topographic map above referred to, an exhaustive study was made of conditions on the floor of Yosemite Valley with the intention of relieving the congested condition around the present village. As a result, three plans were drawn in the course of the studies made.

In addition to the village plan, studies were made for the new hotel to be constructed on the floor of the valley. Plans were also drawn for the new hotel to be constructed at Glacier Point, together with tentative studies for 12 village buildings.

In conjunction with the work done on the replanning of the village, an entire new plan of operation for the concessions in Yosemite National Park was considered. This plan contemplated the granting of a concession to a large operator who would build a hotel of sufficient size to accommodate the demands on the floor of the valley, a smaller hotel at Glacier Point, and 15 mountain inns in the High Sierra in the park, to be built at the rate of three inns each year. Several attempts have been made in the past to secure a concessionaire who would perform this service, but all had been unsuccessful, due to the fact that certain terms could not be agreed upon. The terms considered in this plan were on a profit-sharing basis, the concessionaire under the terms of this arrangement to receive a permit of 20 years' duration and to share the net profits of his concession with the Federal Government. This plan of sharing profits will overcome the difficulty of establishing a graduated scale of charges, thereby making it possible to grant a long-term permit.

With a large hotel on the floor of the valley, a new one on Glacier Point, and a chain of mountain inns throughout the park so spaced that they will be within easy walking distance of one another, it will be possible for those of small financial means to see the entire park to an extent that is now denied them.

In addition to this, the adoption of the village plan will do away with the unsightly buildings that now mar the scenery and will establish a village properly planned, comprising buildings of carefully studied architecture.

The above paragraphs have dealt with work originating in this office. The remainder of the work done in this office will be segregated under the headings of the parks for which the work was done.

YOSEMITE NATIONAL PARK.

In addition to the work above outlined, plans and specifications for the new El Capitan Bridge over the Merced River were prepared in this office, and the bridge constructed under contract for the sum of $2,965.

Plans were also drawn for a new bridge over the Merced River in the vicinity of the present village, which plans are now being considered by bidders.

Plans and specifications were drawn for ranger cabins in the Yosemite National Park, three of which were built at a total cost of $2,990.

In December, 1914, new regulations for the park ranger force were drawn and promulgated by the Secretary. In conformance with these regulations a uniform was designed and insignia of the officers selected. The park rangers in Yosemite National Park are now uniformed according to regulation, and the organization of the park ranger force under the new regulations has been perfected and has demonstrated the merits of the steps taken.

CRATER LAKE NATIONAL PARK.

Plans were begun on the new village for Crater Lake National Park in the year 1915. The work done under this plan comprised studies in architectural character, together with an investigation of

the most feasible method of laying out roads for the circulation of traffic.

In addition to this work, a tour of inspection was made, together with a study of the road and trail system in this park.

MESA VERDE NATIONAL PARK.

A tour of inspection was made of this park in the late summer of 1914, and the needs of roads, trails, and other developments carefully considered. Plans and specifications were drawn for a ranger cabin to be built of stone in the vicinity of the ruins of Spruce Tree House.

GLACIER NATIONAL PARK.

The work in this office on this park has been confined to the purchasing of materials and planning of the road and trail system which followed as a result of a more or less prolonged inspection of the park.

SEQUOIA NATIONAL PARK.

Trips of investigation have been made to Sequoia National Park, and a system of roads and trails planned. A survey has also been made (finished in June, 1915) of the Mineral King Road, which traverses the park, together with a survey and location of the proposed changes necessary to make this road practical and passable to motor-propelled and other vehicles.

RECOMMENDATIONS

AS TO THE OFFICE OF THE GENERAL SUPERINTENDENT AND LANDSCAPE ENGINEER OF NATIONAL PARKS.

The following recommendations are based upon the assumption that it is the Secretary's desire to hold the general superintendent and landscape engineer responsible for the work in the national parks and that the general superintendent should in turn hold the officers in the parks responsible to him.

The general superintendent should have the authority to employ or dismiss any men in the service, and that suspension should remain effective until revoked by the Secretary.

Allotments from the annual appropriations should be made in the general supperintendent's office after a general plan for the expenditure of money has been submitted to the Secretary and approved.

I recommend that the general superintendent be given authority to enter into contracts for construction work as well as for the purchase of materials by contract in accordance with the general scheme of expenditures approved by the Secretary.

This office has purchased all supplies for Yosemite, Sequoia, and General Grant National Parks since April 1, 1915. Considerable saving has been accomplished by purchasing in San Francisco rather than through local dealers in the neighborhood of the parks. Some purchasing has also been done for other parks west of the Rocky Mountains, and in some instances from 15 to 25 per cent has been saved. I recommend that this system of purchasing and the forms

used be adopted and the practice extended throughout the various parks wherever practicable.

In order that the general superintendent may be thoroughly familiar with the phases of the work for which he is held responsible, it is my opinion that correspondence from the parks should be addressed to the general superintendent, or through him to the Secretary, and, likewise, all communications that have to do with operations in the parks should be forwarded from the department through the general superintendent to the parks.

I recommend that all regulations and instructions to be enforced in the parks be promulgated from the general superintendent's office.

It is impossible to accomplish economical management of the parks without the aid of a practical working unit cost-keeping system. Such a system has been installed in the Yosemite National Park and is producing most satisfactory results. I recommend that this system be extended to each and every other national park. This will involve the taking of an inventory on the physical assets in each park such as was taken in Yosemite. This work should also be carried on in other parks.

The title of general superintendent and landscape engineer of national parks carries with it two distinct and separate classes of duties. There is sufficient work under each of these two titles to keep one man very busy throughout the year. It is not humanly possible for one man to act in the capacity of general superintendent and landscape engineer and perform the duties that each of these two titles require. I recommend, therefore, that the title be split and two officers appointed for this work—a general superintendent and a landscape engineer.

Perhaps the most important work that can be carried on in this office is the planning of improvements in the various parks, and I strongly urge that the work that has begun in the way of planning new villages for the Yosemite and Crater Lake National Parks be continued in the remaining parks where such work is needed.

Several attempts have been made to establish by an act of Congress a national park service, and there can be no doubt in the minds of those who are familiar with the problems of administering our national parks that such a service is seriously needed. I would urge that every effort be made to secure the enactment of a law that will establish the national park service on a firm footing.

The title of superintendent in any national park should be dispensed with and a title of supervisor should indicate the officer in immediate charge of the park, as the title of superintendent is confusing with the title of general superintendent.

RECOMMENDATIONS FOR THE VARIOUS PARKS.

YOSEMITE NATIONAL PARK.

The steps that have been taken for the erection of the new hotel on the floor of the valley and another at Glacier Point, and a chain of mountain inns throughout the park, will undoubtedly bring a materially increased travel. To prepare for this, more road and trail construction work in the park is necessary. The road from El Portal

to the valley should be widened and properly surfaced. The road on the north side of the valley from Pohona Bridge to the new hotel site should be surfaced. That portion of the road on the south side of the valley which is now a dirt road should be surfaced. A new bridge should be erected in place of the present Sentinel Bridge, which has several times been condemned and which is now not strong enough to carry passenger trucks.

When the village on the north side of the river is completed it will be necessary to erect new barns and headquarters for the Government employees and stock. There is also a crying need for a new administrative building. The old building occupied at present by the superintendent is insanitary and rapidly falling to pieces.

It is recommended that three motor-driven power sprinkling trucks be purchased for use in sprinkling the roads in Yosemite National Park, as the cost of sprinkling the roads in this park by horse-drawn sprinklers is entirely too high. For the months of May, June, July, and August, 1915, 6,162 miles of roads were sprinkled in this park, at an average cost of 93 cents per mile. The reason for this apparent high cost is that horse hire and forage for the subsistence of stock is very high. The average cost per horse-day for the months of May, June, July, and August was $1.07. By installing motor-driven sprinkling trucks and making some slight improvements in the water system this expense could be reduced 50 per cent.

The purchase of the Tioga Road has widened the activities of the park ranger force, and this force should be augmented to control the travel.

The park rangers in the Yosemite Park have no headquarters of their own in the valley. A ranger barrack should be erected, in which will be lockers for each ranger. A stable should be constructed in conjunction with the barrack where the park rangers called to the valley for special duty may stable and feed their horses.

An information bureau has been in operation for a few months during the season of 1915 and has met with enthusiastic approval on the part of the public. This bureau gives information direct to the tourists regarding the condition of the roads, trails, and all other information desired in a way that is not biased by local prejudice. I strongly urge that a system of local information bureaus operated by the department be adopted in all of the parks and continued in Yosemite National Park.

A collection of stuffed birds and animals indigenous to the area covered by Yosemite National Park has been started, and the same is being placed on exhibition in the bureau of information. The exhibits are supplied through Dr. Joseph Grinnell, director of the museum of vertebrate zoology of the University of California. Some of the park rangers have been instructed by Dr. Grinnell and his assistants in the securing and stuffing of the birds and animals. The work done to date has aroused considerable public interest and has met with enthusiastic appreciation.

A collection of wild flowers is also being completed and placed on exhibition. With each flower is a water-color drawing showing the true color of the flower. This work is being carried on through the park ranger force and the bureau of information.

SEQUOIA NATIONAL PARK.

The Mineral King Road, which traverses the Sequoia National Park from the western boundary to the eastern boundary, connects the San Joaquin Valley with a small summer resort named Mineral King. There is urgent demand on the part of the public to use this road, which use has been denied them. I recommend that the department put this road in shape for travel at the earliest possible date.

The Mount Whitney Power Co. has built a road up the canyon of the Middle Fork of the Kaweah. Surveys for the extension of this road should be made so that it may connect with the Giant Forest Road, thus forming a loop in the park. Another survey of a road connecting Sequoia Park with General Grant Park has been made by the Office of Public Roads. This survey should be considered and, if accepted, adopted and plans for its construction undertaken.

To the east of Sequoia National Park is some of the finest mountain scenery in the world. The area in which the scenery lies is of little or no value for purposes other than the pleasure of scenery lovers. It contains the great Kern Canyon, Kings River Canyons, and Mount Whitney, the highest peak in the United States, together with almost innumerable other features. I can not recommend too strongly that the Sequoia National Park be enlarged to take in the areas to the southeast and east which contain these examples of wonderful mountain scenery.

CRATER LAKE NATIONAL PARK.

The present headquarters of the superintendent are at a point a thousand feet below the rim of the crater. The location is not satisfactory. Plans should be made for a secondary summer headquarters on the rim of the crater, either at the location of the present hotel or at some other point on the rim.

The ranger force in this park is not of sufficient size to adequately protect the park in the winter. The force should, therefore, be augmented to prevent poaching.

A trail should be built as near to the water's edge as possible and as far around the lake as practicability will allow.

Ranger cabins in the form of automobile-checking stations should be erected at each roadway entrance to the park.

The patrolling of this park is rather difficult, as it is in all parks, and in order that the superintendent may perform his duties effectively he should be furnished with an inexpensive automobile.

MOUNT RAINIER NATIONAL PARK.

The entire stretch of road in this park from the park entrance to Paradise Valley should be surfaced with crushed rock.

A survey of the entire road and trail system as outlined on the roads and trails map executed in this office should be made and the feasibility of following out the plans indicated should be investigated. Steps should be taken at once for the development of an encircling road around Mount Rainier and all construction work should be confined to portions of the general plan.

The village at Longmire Springs is particularly unsightly, and steps should be taken to either clean this place and bring about a more harmonious architectural scheme or the site should be abandoned and another one established. The plans for extensions of the trail system as recommended by the supervisor in his report should be adopted.

Tourists climbing the mountain are frequently overcome with fatigue before they reach the summit and are forced to stop over en route. A small comfort station should be erected along the trail to accommodate such people.

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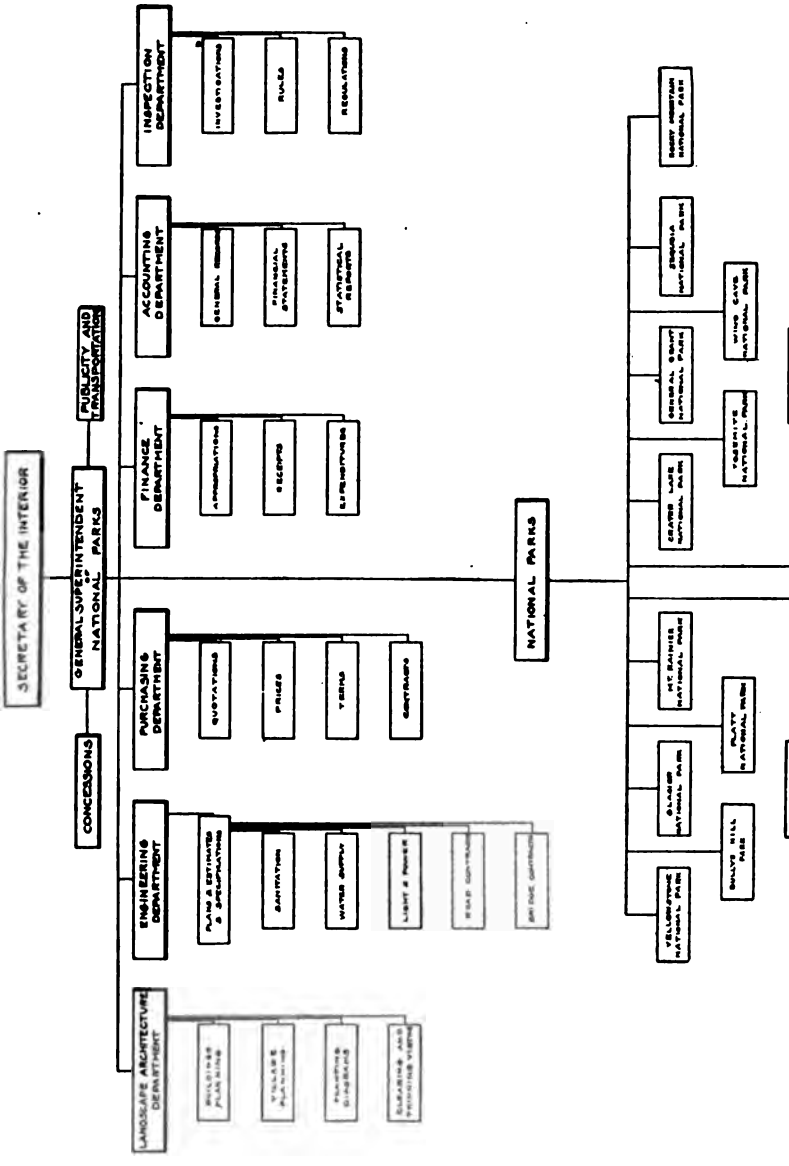

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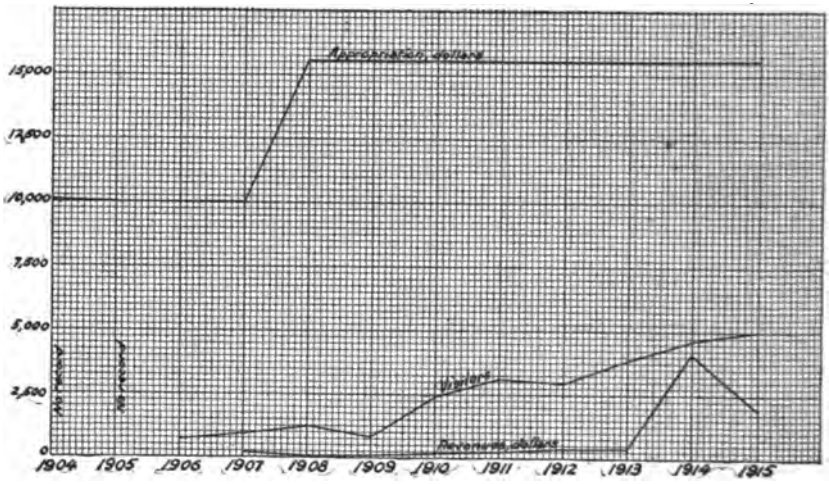
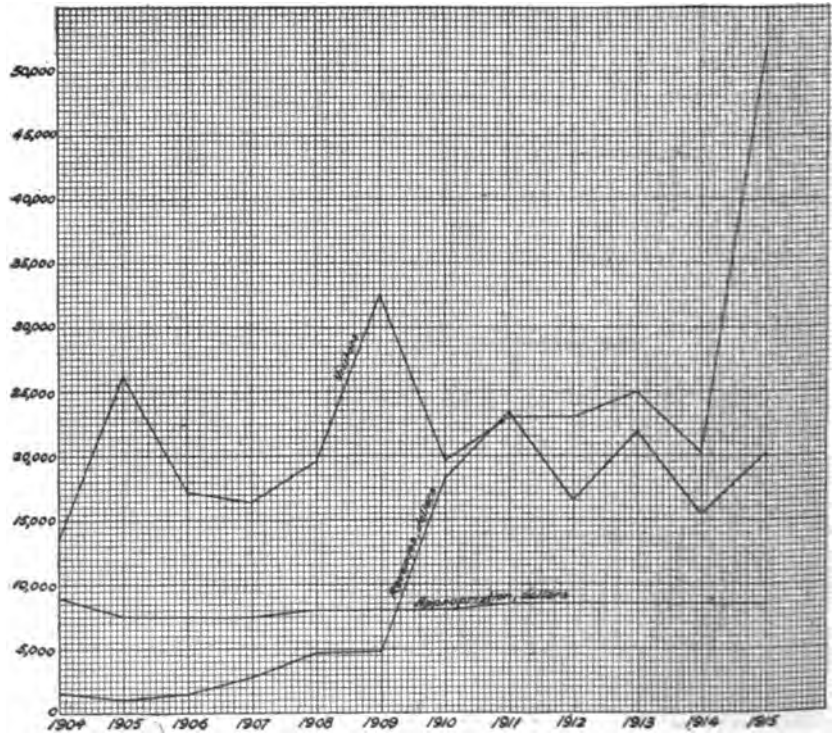
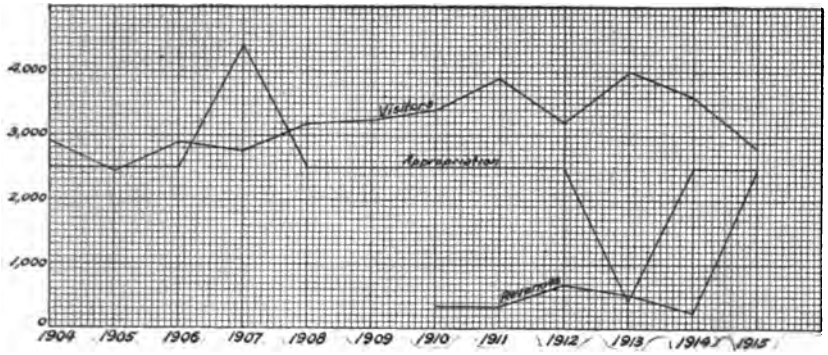


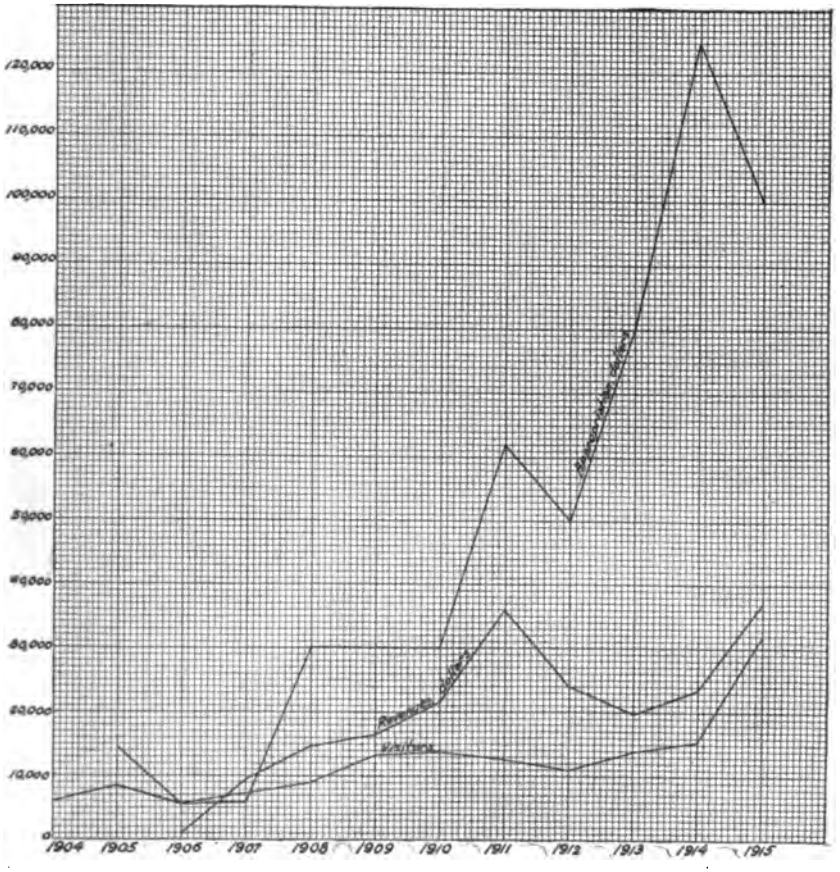
Appropriations, revenues, and visitors, Sequoia National Park.



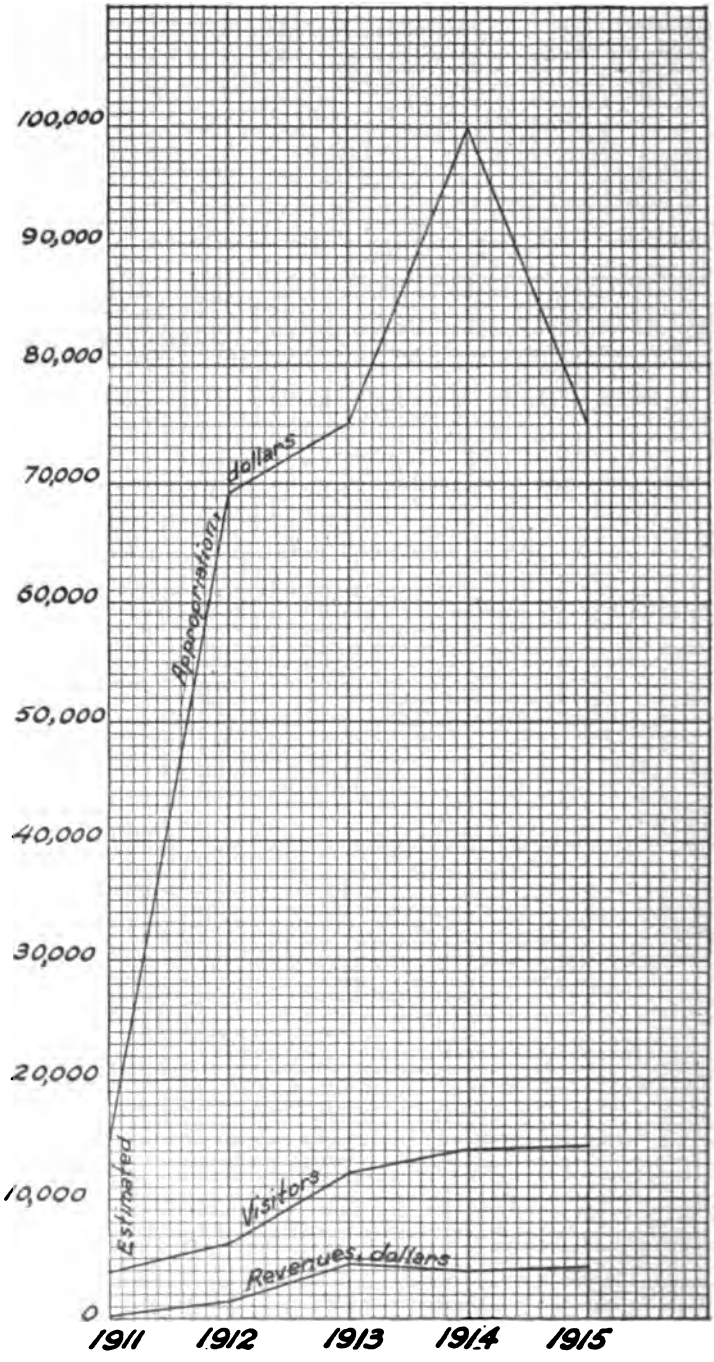
Appropriations under Interior Department, revenues, and visitors, Yellowstone National Park. Appropriations for road work under War Department not included in this diagram.



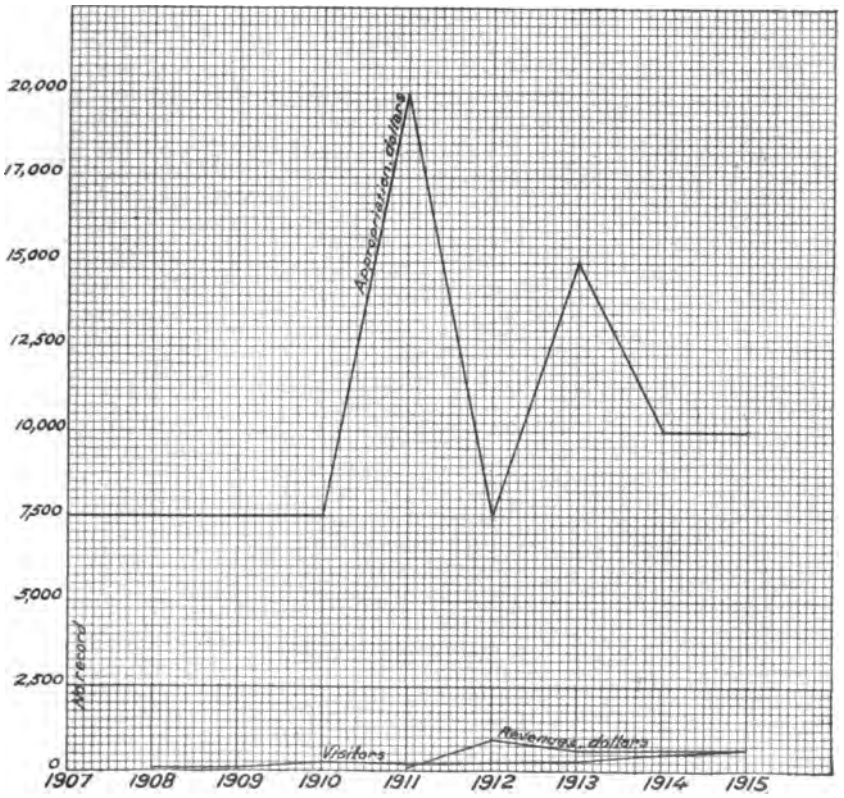
Appropriations, revenues, and visitors, Wind Cave National Park.



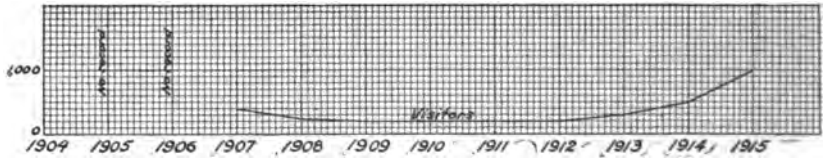
Appropriations, revenues, and visitors, Yosemite National Park.



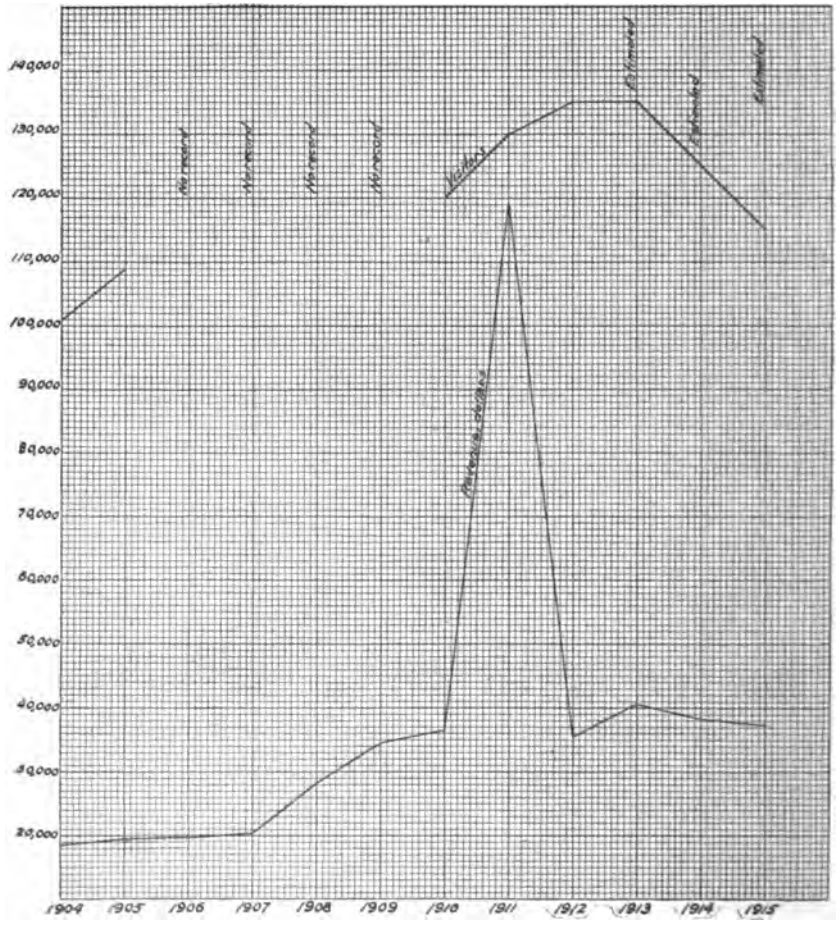
Appropriations, revenues, and visitors, Glacier National Park.



Appropriations, revenues, and visitors, Mesa Verde National Park.

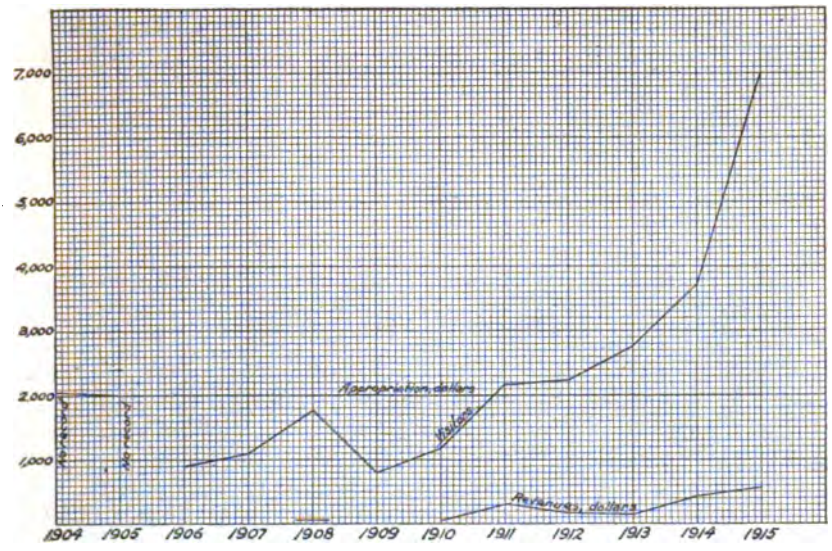


Visitors, Sullys Hill Park.

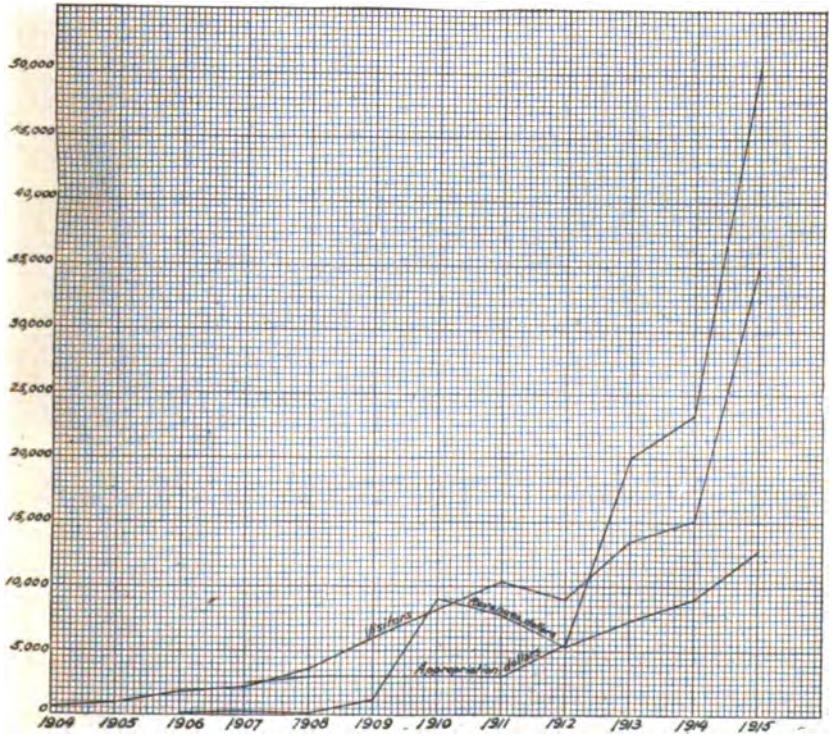


Revenues and visitors, Hot Springs Reservation.

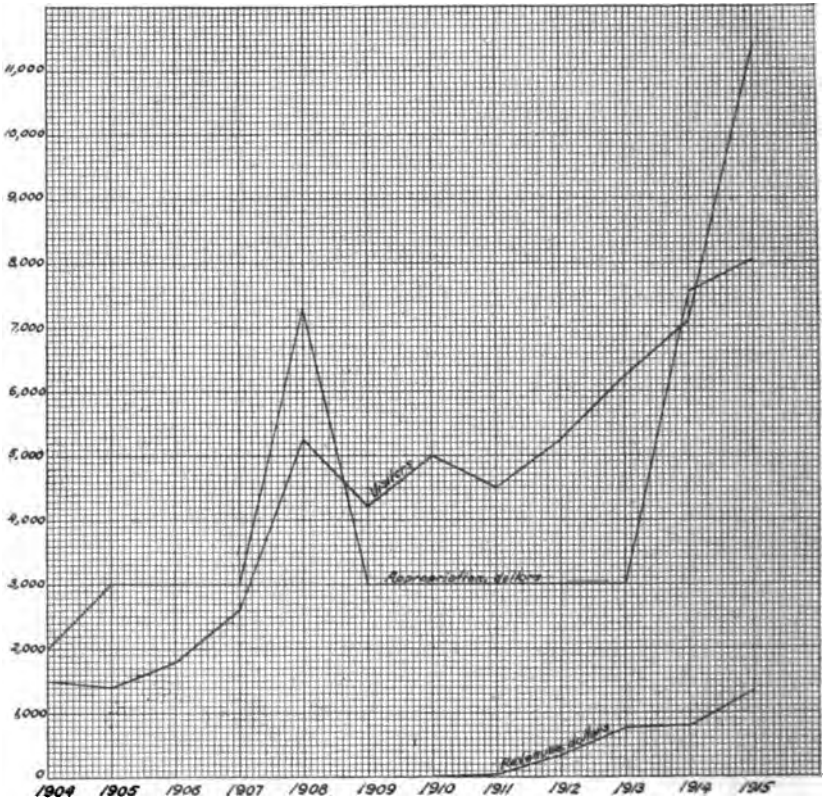
Lots sold at Hot Springs in March, 1911, yielded $82,818; other revenues amounted to $36,060.



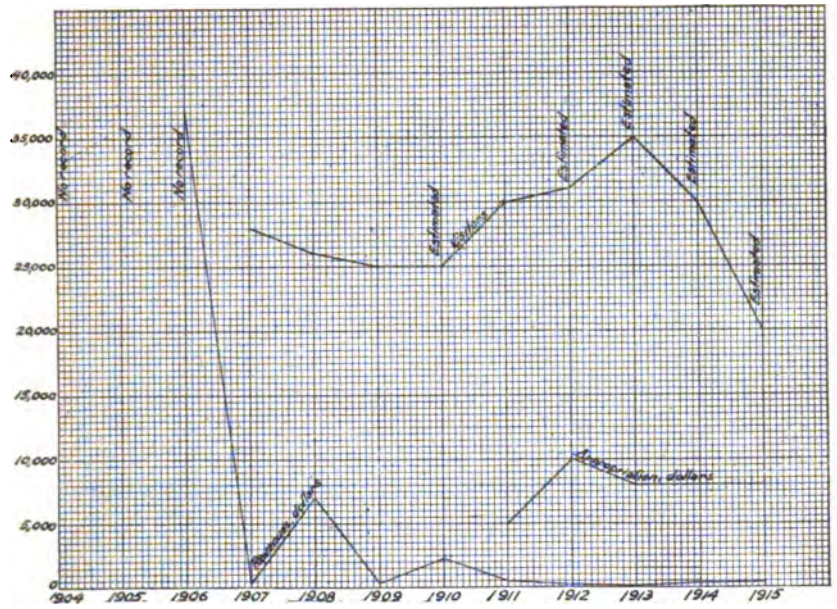
Appropriations, revenues, and visitors, General Grant National Park.



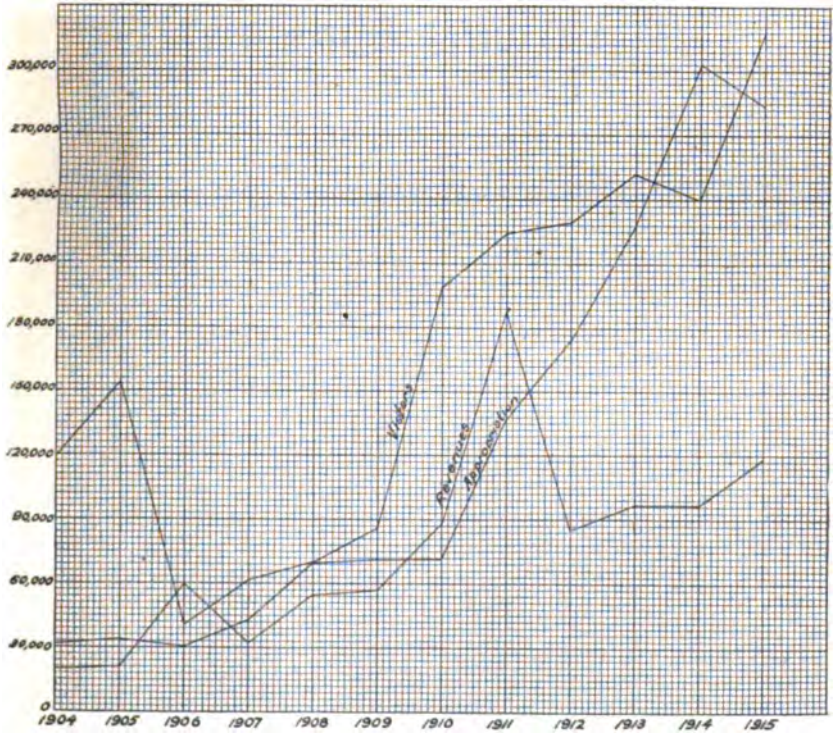
Appropriations under Interior Department, revenues, and visitors, Mount Rainier National Park. Appropriations for road work under War Department not included in this diagram.



Appropriations under Interior Department, revenues, and visitors, Crater Lake National Park. Appropriations for road work under War Department not included in this diagram.



Appropriations, revenues, and visitors, Platt National Park.



Appropriations under Interior Department, revenues, and visitors, all national parks. Appropriations for road work under War Department in Yellowstone, Mount Rainier, and Crater Lake parks not included in this diagram.

REPORT OF THE ACTING SUPERINTENDENT OF THE YELLOWSTONE NATIONAL PARK.

REPORT OF THE ACTING SUPERINTENDENT OF THE YELLOWSTONE NATIONAL PARK.

DEPARTMENT OF THE INTERIOR,
YELLOWSTONE NATIONAL PARK,
OFFICE OF SUPERINTENDENT,
Yellowstone Park, Wyo., September 30, 1915.

SIR: I have the honor to submit annual report of the condition of affairs in and the management of the Yellowstone National Park from October 15, 1914, to the present date.

GENERAL STATEMENT.

The Yellowstone National Park, set aside by act of March 1, 1872 (secs. 2474 and 2475, R. S., 17 Stat., 32), is located in the States of Wyoming, Montana, and Idaho. It has an area of about 2,142,720 acres and an average altitude of about 8,000 feet.

The military force available for duty in the park consists of a detachment of 200 soldiers of the Cavalry Arm of the service, trained in the different Cavalry regiments and detached therefrom for this special service.

The headquarters is located at Fort Yellowstone, but the command also garrisons 15 soldier stations scattered throughout the park, requiring 135 men during the tourist season and 75 during the remainder of the year.

A telephone system connects the soldier stations and the post.

In addition to the military force which is maintained by the War Department, the Interior Department furnishes certain civilian employees, namely, a clerk, scouts, a buffalo keeper, etc.

The detachments of soldiers at the 15 stations performed their duties in a very satisfactory manner.

TRAVEL.

An unusually early spring opened all roads to travel before the tourist season, but on account of heavy rains in May and up to past the middle of June, they were very muddy for a few days after the opening on June 14, but dried up so rapidly that they required sprinkling before the end of the month.

The aggregate number of persons making park trips during the season of 1915 was as follows:

Travel during the season of 1915.

Guests at hotels:		
Entering via the western entrance with Yellowstone-Western Stage Co	20,151	
Entering via the northern entrance with Yellowstone Park Transportation Co	6,722	
Entering via eastern entrance with Holm Transportation Co	144	
		27,017

Wylie Permanent Camping Co.:		
Entering via northern entrance	3,306	
Entering via western entrance	7,027	
Entertaining via eastern entrance	208	
		10,541
Shaw & Powell Camping Co.:		
Entering via northern entrance	3,261	
Entering via western entrance	1,966	
		5,227
Hefferlin Camps:		
Entering via northern entrance	1,080	
Entering via western entrance	612	
		1,692
With other licensees of personally-conducted camping parties		265
Making park trips with private transportation:		
With automobiles	3,513	
With other private transportation as "private camping parties"	3,448	
		6,961
Total making park trips		51,703
Number making short trips with special licensees		192
Grand total of travel, season of 1915		51,895

The Yellowstone Park Hotel Co. reports that 27,017 people were accommodated at the hotels in the park during the season of 1915, of which 6,722 entered at the northern entrance, 20,151 at the western entrance, and 144 at the eastern entrance.

The Yellowstone Park Boat Co. reports that 4,277 people took the boat trip across Yellowstone Lake during the season, of which 1,863 were traveling with the Yellowstone Park Transportation Co., 1,699 with the Yellowstone-Western Stage Co., 589 with Wylie Camping Co., 111 with Shaw & Powell Camping Co., 4 with Holm Transportation Co., and 11 miscellaneous.

Travel by the different entrances.

From the west, via Yellowstone, Mont	32,551
From the north, via Gardiner, Mont	17,463
From the south, via Jackson, Wyo	331
From the east, via Cody, Wyo	1,550
Total	51,895

The travel by way of Tower Falls by regular tourists returning to Mammoth Hot Springs from Grand Canyon was less, in proportion to total travel, then last year. The falling off in the number taking this trip, which is the most beautiful in the park, was due to a desire on the part of the transportation companies to spare their horses the pull up the mountain and the longer journey. All touring the park in automobiles took the Mount Washburn route and were most enthusiastic over the scenery.

The Wylie Permanent Camping Co. had 158 wagons in use during the season, the Shaw & Powell Camping Co. had 85 wagons in use. W. N. and O. M. Hefferlin had 42 wagons and 4 saddle horses in use transporting tourists and supplies to their 4 permanent camps in the park, and in addition movable camp licenses were issued during the season, covering a total of 43 wagons and 247 saddle and pack animals and 4 special wagons for livery work.

An inspection of the figures giving the travel for the season shows that about three-fifths of all the visitors to the park entered by the

western gateway. This was due to several causes, chief of which was the reduced rates on certain central western railways to the Panama-Pacific Exposition in San Francisco, with side trips to National Parks and other points of interest. This concentration of travel to one entrance made the task of the transportation companies operating therefrom exceedingly difficult, but with the exception of a few days when the numbers arriving were too large for all to be given transportation the traveling public was well handled.

AUTOMOBILES.

Under instructions in connection with your announcement of April 21, 1915, that automobiles would be admitted to the park beginning August 1, such privilege to be extended to pleasure vehicles only, preparations were at once begun. Four extra first-class rangers were employed for the purpose of checking automobiles, telephone lines were extended and old ones repaired, and new telephones installed at several points along the roads where checking was necessary. On June 7 and 8 a trial trip was made by park officers and members of the transportation companies, as a result of which regulations and schedules were planned and recommended to the department, and these were printed and distributed before the opening date.

Prior to the opening date for automobiles, August 1, heavy rains throughout the West made the roads approaching and in the park heavy and difficult, yet 50 automobiles with 171 tourists entered the park on that day. No accidents to the occupants of horse-drawn vehicles due to automobiles marred this radical departure in viewing the park and the regulations and schedules worked perfectly, although travel was the heaviest in the history of the park. It was found possible to grant special schedules and night travel to those whose time was limited, and it is believed that new schedules can be added to those in force which will add to the pleasure of those touring the park in automobiles. Another season should find open to automobiles the road from Tower Falls to the northeast corner of the park, passing through the Lamar River and Soda Butte Creek valleys, by the buffalo farm and on to the lofty and rugged mountains that border the northern boundary of the park. The officers, enlisted men, and rangers had no difficulty in handling the automobile travel, and their efforts to keep cars within the schedules were met by courteous and appreciative responses on the part of the occupants.

The following table shows the total number of automobiles, and number of tourists carried by them, that have taken advantage of the opportunity to make the park trip from August 1 to the end of the season:

Automobile travel.

	Automobiles.	Tourists.
Entering via the northern entrance	365	1,377
Entering via the western entrance	392	1,403
Entering via the eastern entrance	193	701
Entering via the southern entrance	8	32
Total	958	3,513

This travel is included in the aggregate number of tourists taking park trips, heretofore mentioned.

On April 21, 1915, authority was granted by the department to issue a permit to Robt. I. McKay, of Cooke, Mont., to transport machinery, ore, and supplies between Gardiner and Cooke, Mont., using 15 automobile trucks and 25 trailers, under proper restrictions as to schedules, etc., and to use one car as a utility or repair car, all on condition that he make certain repairs to the roads between Soda Butte and Mammoth Hot Springs, and pay a license fee of $20 per annum for each truck used, $10 per annum for each trailer used, and $10 per annum for repair and utility car. Mr. McKay arrived at Gardiner about July 15 with one truck and one utility car. He deposited funds to cover license fee on these and the following morning went to Cooke with them, after having made arrangements with the engineer officer in regard to repairing the roads. Since that time he has had the truck at work in connection with the work of repairing the road between Tower Falls and Cooke, but the improvements have not progressed up to the present time sufficiently as to render it practicable to haul heavy loads over the roads with trucks, but his crews are still at work.

Hon. Stephen T. Mather, Assistant to the Secretary of the Interior, visited the park twice during the season, once before and once after the admission of automobiles.

CONCESSIONERS.

The Shaw & Powell Camping Co. completed the work begun last season of constructing log dining rooms, kitchens, and storerooms at permanent night camps.

The Wylie Permanent Camping Co. constructed a temporary log building for use as a hospital at its Swan Lake Camp, and another at the Riverside camp which accommodates the offices and news stand, and is also used as a recreation room.

Mr. Henry J. Brothers completed his bathhouses and plunge at Upper Geyser Basin and opened them to the public on July 1. These baths have proven popular with travelers as well as with employees of the park. Mr. Brothers reports that the total number of bathers since July 1 was 7,681.

Mr. C. A. Hamilton bought the Klamer general store at Upper Geyser Basin and took charge of it at the beginning of the season.

STREAM GAGING.

Mr. G. Clyde Baldwin, district engineer of the water-resources branch of the United States Geological Survey, with headquarters at Boise, Idaho, who has charge of this important feature, has furnished the following report on this work for the year:

Records were obtained from the following gaging stations which were established during June, 1913:

Madison River near Yellowstone, Mont.
Gibbon River at Wylie Lunch Station, near Yellowstone, Mont.
Yellowstone River above Upper Falls, near Canyon Station.
Snake River at south boundary of the Yellowstone National Park.

The small allotment of funds available for this work has proved sufficient only to keep up the necessary office work connected therewith and to permit the making of one visit during the year to each

of the gaging stations. Consequently it is still impossible to compute discharges of Snake and Yellowstone Rivers for anything except low stages of flow because of the impossibility of securing high-stage measurements until cables have been installed at these stations.

Detailed descriptions of the gaging stations, together with summaries of current meter measurements, and gage height and discharge data for each will be published in the annual Water-Supply Papers of the United States Geological Survey, Parts VI and XII, respectively, for Missouri and Snake River drainage areas.

ROADS.

The road work in the park is in charge of Maj. Amos A. Fries, United States Engineer Corps, who has furnished the following notes on the work in the park under his department:

The sundry civil bill of March 3, 1915, appropriated money as follows for road work in Yellowstone National Park and the adjacent forest reserve on the east and south:

Yellowstone National Park: For maintenance and repair of improvements, $125,000, including not to exceed $7,500 for maintenance of the road in the forest reserve leading out of the park from the east boundary, and not to exceed $2,500 for maintenance of the road in the forest reserves leading out of the park from the south boundary, to be expended by and under the direction of the Secretary of War, to be immediately available: *Provided*, That no portion of this appropriation shall be expended for the removal of snow from any of the roads for the purpose of opening them in advance of the time when they will be cleared by seasonal changes.

For widening to not exceeding eighteen feet of roadway and improving surface of roads and for building bridges and culverts from the belt-line road to the western border from the Thumb Station to the southern border, and from the Lake Hotel Station to the eastern border, all within Yellowstone National Park, to make such roads suitable and safe for animal-drawn and motor-propelled vehicles, to be immediately available, $50,000.

For completing the widening to not exceeding eighteen feet of roadway and improving the surface of roads and for building bridges and culverts in the forest reserve leading out of the park from the east boundary, to make such roads suitable and safe for animal-drawn and motor-propelled vehicles, to be immediately available, $20,000.

In addition there remained available on October 1, 1914, about one-half of the $255,000 appropriated for the same purposes in the sundry civil bill of August 1, 1914 (pp. 8 and 9, report of acting superintendent, September 30, 1914).

On account of early spring and the desire to expedite work in anticipation of record travel through the park during 1915, due to the combined influence of the European war and of the San Francisco and San Diego Expositions, work was vigorously prosecuted during the spring and summer of 1915 under both appropriations, and consequently almost all crews have either exhausted their apportioned funds or completed their work prior to the date of this report and have been disbanded.

The work during the year included general repair and maintenance of the entire system, including the west, south, and east approaches, both in the park and in the forest reserve on the east, and the Cooke City road; widening and improving the west, south, and east approaches, including the east forest reserve; sprinkling of 100 to 112 miles of belt line and west approach road; repair and construction of bridges; construction of concrete, wood, and galvanized-iron culverts; clearing of dead and fallen timber from the roadside; reshaping and ditching roads; maintenance of trees, shrubs, vines, and lawns.

In the following summary the work will be divided into that done on the belt line, the west approach, the south approach, the east approach, the Cooke City road, and work in general.

BELT LINE ROAD (INCLUDING NORTH ENTRANCE ROAD).

General road repairs.—In the fall of 1914, in order to prevent excessive damage to the roads during the winter, work on a considerable portion of the belt line was done to improve the drainage, smoothing and reshaping the roads, cleaning out ditches and culverts, and constructing "thank-you-ma'ams," or water bars, on some of the steeper grades. This work extended generally from the Thumb to Gardiner, via Lake, Canyon, Norris, and Mammoth, and from Norris south toward Madison Junction. Similar repairs were made on about 4½ miles of the Mount Washburn road, between miles 10¾ and 15¼ from Canyon Junction.

Owing to continued rainy weather during the latter half of May and the first half of June, during the spring of 1915, and to the great amount of freighting being done into the park by the hotels and various transportation companies in anticipation of a large amount of travel in the park during the summer, the road in a number of places became very badly rutted and in some places almost impassable. It became necessary early in June to establish so-called drag stations at a number of the worst places, from which split-log drags were operated over the roads, thus smoothing them out, reducing the ruts, and giving the roads a chance to drain off. The same bad weather caused a large fill over the 10-foot reinforced concrete arch culvert, built in 1914 about 1,000 feet south of Canyon Junction, to slide away; and a very considerable amount of work was required to repair this damage and bring the fill up to the cross section required. Between May 20 and July 3 a flying grader squadron, consisting of four graders, was sent entirely around the belt line, shaping up the roads, cleaning ditches, cleaning out and making minor repairs to culverts. To assist in maintaining the roads during the tourist season, each sprinkler crew was equipped with a split-log drag; and whenever rainy weather gave an opportunity for so doing, these drags were used to reshape and smooth out the ruts in the roads. This process the heavy tourist traffic made very necessary.

Gardiner slide.—The slide in the Gardiner Canyon, about 2 miles from the north entrance at Gardiner, Mont., which has given considerable trouble to the Gardiner Road for a number of years, was cut back in the fall of 1914 and the spring of 1915, prior to the tourist season, by means of hydraulic sluicing. During the fall of 1914 a 4-inch pipe-line, fed by an electric motor-driven pump, was used to furnish the water for the sluicing; but in the spring of 1915 this was displaced by a 6-inch pipe-line, conveying a gravity stream from a lake about a thousand feet west of, and 130 feet above, the top of the slide. This latter method allowed a greater amount of material to be moved and at less cost. It is believed, however, that the slide will continue to cause trouble for several years to come and will require sluicing once or twice a year until stopped. Notwithstanding the very excellent condition of the road at this point when the sluicing was discontinued early in June, the slide has again

encroached on the road, although not sufficiently to cause any inconvenience to traffic.

Sprinkling and dragging.—During the tourist season of 1915 from 100 to 112 miles of road was sprinkled, including, however, a large portion of the west approach. After the continued rains of late May and early June, an excessively dry spell started in and lasted for about a month. This, coupled with the excessive evaporation due to the high altitude of the park, made it impracticable in many places during this period for sprinkling to cope with the situation and satisfactorily lay the dust. These conditions were made somewhat worse by the fact that this excessive dry period unfortunately occurred at the very beginning of the sprinkler season. When the sprinklers are first started, the men operating them are new and inexperienced, and numerous small defects that occur each year in water ditches, rams, tanks, and valves have to be remedied before the sprinkling system can attain its maximum efficiency. In the latter half of July and thereafter occasional showers occurred, however, and these greatly relieved the situation. In addition to laying the dust, the showers enabled the sprinkler crews to operate their road drags, with which all crews are equipped, as already stated under "General Road Repairs."

The length of road sprinkled was increased at the opening of the season in 1915 to 112 miles. Difficulty was experienced, however, in several places, through the water supply of tanks giving out, due, as last year, to the very light snowfall during the preceding winter. The sprinklers which run between the Thumb and the 5-mile post toward the Lake, and between the 1 and 6-mile posts from the Canyon toward Norris, had to be abandoned during August, the benefits not being sufficient to justify the cost.

Considerable experimenting was done prior to the sprinkling season with gasoline engine pumping sets, with which it was hoped to replace all hand pumps on the sprinkler wagons where pumping is necessary, thus economizing in labor and extending, without increase in cost or plant (except for the purchase of the pumping sets) the total number of miles sprinkled. These experiments have not, however, shown the gasoline sets to be sufficiently reliable to justify their actual installation in the place of the present hand pumps, as owing to the hard conditions of service and to the probably inexpert attendance, the gasoline pumps would be out of commission a great part of the time and the sprinkling consequently often interrupted.

Oiling Gardiner Road.—In the spring of 1915, 1.6 miles of road inside the entrance arch at Gardiner was scarified, regraded, and treated with oil and gravel surfacing, as was also the 0.3 of a mile of branch freight road at Gardiner. For this purpose a light oil, which was left over from the preceding summer, was used, the intention being to prevent dust and avoid having to sprinkle this stretch of road. The process used answered the purpose very well, much better than the application of thin oil on the unprepared road, as experimentally done one year ago. It is not believed, however, that this stretch of road will have the wearing qualities expected from the oil and rock macadam surfacing used at the west entrance.

Resurfacing.—In addition to the oil surfacing at Gardiner, there were resurfaced during the year several stretches of road which had

been particularly troublesome in wet weather, aggregating about 7 miles, as follows: From about 1½ to 4¾ miles from Mammoth Springs toward Norris; from Canyon Junction about 1,000 feet south to the Canyon Arch Bridge; and 7½ to 10½ miles from the Canyon Junction toward the Lake Hotel.

Norris realignment.—A realignment a little more than 1 mile in length was built at the Norris Geyser Basin to avoid two bad hills—one north and one south of the Minute Man Geyser.

Bridges and culverts.—The reinforced concrete Canyon Arch Bridge, which was built under contract, was completed and accepted on June 16, 1915. This is one of the most beautiful structures in the park—210 feet long over all, with a 145-foot arch.

In line with the policy adopted several years ago, there were built or installed this spring on the section between the Upper Basin and the Thumb, 12 reinforced concrete-slab culverts, eight being of 8-foot span and the other four of 6-foot span, and about 14 galvanized-iron culverts, mostly 18 inches in diameter, and three triple 24-inch galvanized-iron culverts, with head walls. There were also installed some galvanized iron culverts at other parts of the belt line, notably about six of 24-inch diameter on the section between the Lake and the Canyon, and about the same number on the realignment, already mentioned, at Norris Geyser Basin.

In addition, a number of wooden culverts were repaired, on all portions of the belt-line system; the wooden bridge on the Bunsen Peak Road, over the Gardiner River, and the four steel bridges between Mammoth and Gardiner were refloored; and several concrete bridges, built in 1914, were backfilled and placed in commission in time for the 1915 tourist season.

WEST APPROACH.

On the west approach maintenance work, similar to that on the belt line, including sprinkling, was done. In addition, the work of widening and improving the road, to make it safe for animal-drawn and motor-propelled vehicles, has been pushed to the limit of the funds appropriated for this purpose.

Widening and grading.—During the year widening and grading of the west approach has been extended to include all of the Madison River branch of the approach, except about 1½ miles (11 to 12½ miles from the west boundary) and about half of the Gibbon River branch. This work has involved considerable minor realignment, and some few more important relocations, including one 2,500 feet long, between 8 and 9 miles from the boundary, which avoided widening and improving a stretch of rocky hillside road and eliminated a bad climb, while going down stream, over a 30-foot hill; and one about 1,000 feet long near the junction of the Gibbon and Firehole Rivers, where the triangle connecting the roads to Yellowstone, Norris and the Fountain, was made considerably smaller, and the grade improved.

Surfacing.—The top surfacing being used on the west approach is an oil and rock macadam. The rock crusher on hand proving to be of insufficient capacity, an additional one was purchased and placed in operation, together with the old one, early this spring. The plant was also increased by an additional road roller and several less important items of machinery. For the storage of oil a concrete pit,

equipped with steam-heating coils, was built at the boundary, at Yellowstone, Montana, with a capacity of two cars of oil, and a track of the Oregon Short Line Railway extended to permit unloading of cars direct into the pit. A retort was also built adjacent to the pit, to heat the oil, prior to use, to a higher degree than practicable with steam.

Five miles of road at the west entrance was completed with oil-macadam surfacing during the year, although it is possible that the last three-quarters of a mile will require considerable repair next spring. The rock used on this particular stretch, although crushed from boulders which seemed of good quality, has not turned out as well as desired under rolling and the wear of traffic.

In the oil-macadam work so far done there have been used two different grades of heavy California asphalt oils, and one mile has been treated with Tarvia, experimentally, in lieu of oil. The wear of these adjacent stretches should, by the next season, give a very good comparison of the different materials used, which will be a valuable aid in further surfacing in the park.

Firehole River realignment.—This realignment, which will replace most of the road lying between the Madison Junction and the Firehole Cascades, was begun in June and completed for a distance of about 3,500 feet. Surveys have been made beyond this distance. This new location will greatly improve the grades and will open up a very fine stretch of river scenery, replacing with an unusually attractive road one which is quite deficient in such qualities. When this new road is completed and opened up it is believed that the main traffic will shift to it instead of passing over the Mesa Road, which, like the present Firehole River branch of the west approach, is extremely uninteresting and hilly.

The new road is for the most part in very heavy rock work, for which reason an air-compressor drilling plant has been purchased and installed, resulting in very considerable increase in speed and decrease in the cost of the work.

SOUTH APPROACH.

IN THE PARK.

In addition to general spring repairs, such as were made on the belt line, the work of widening and improving the south approach for combined horse-drawn and automobile traffic, as specially appropriated for by Congress, was continued.

Widening and grading.—About 5½ miles of road south of the Thumb has been widened and graded during the year, including a realignment about 3,000 feet long.

Bridges and culverts.—The 4-span log bridge over Lewis River was rebuilt, as were several other small bridges and culverts.

IN THE FOREST RESERVE.

Snake River Bridge.—The allotments for the two fiscal years 1915 and 1916 for the road in the forest reserve south of the park have been lumped for the purpose of building a 100-foot span steel bridge over Snake River. The contract for the steel and erection has been let, and the abutments have been built. The bridge will not be completed until next year.

EAST APPROACH.

As on the belt line, general repairs were made to the east approach, both in the park and in the forest reserve, to maintain same in condition for traffic; and the work of widening and improving the road, to make same safe for both animal-drawn and motor-propelled vehicles, under the special appropriation for this purpose, was pushed as much as the money available would permit.

IN THE PARK.

Early snows and freezing weather in the fall of 1914, and the extremely wet weather in the spring of 1915, retarded the work and increased the cost considerably on the section of the east road located inside the park.

Widening and grading.—This work has been brought to completion on all except about 5 miles, of which 1½ miles (9½ to 11 miles from the Lake Junction) has been partially widened. The balance uncompleted consists of the 2 miles between the 11 and 13-mile posts and about 1½ miles between the 19 and 21-mile posts, which last-named stretch involves considerable rock work.

The work during the past year included grading down short hills and filling in the intervening low places, besides widening, between the 4 and 6½-mile posts; widening and grading from the 6½ to the 9½-mile points, including a 1,000-foot realignment to greatly improve the alignment and grade on the hill eastward from Turbid Lake; partially widening and grading between the 9½ and 11-mile posts; a 1½-mile relocation of the road at the crossing of Cub Creek, about 13½ miles from the Lake Junction, where the old road was in a bad location on the creek bank, and subject to serious slides (it was here considered better and more economical to build a new road on nearly level benches farther from the creek than to improve the old road); and widening and grading between the 14½ and 18-mile posts (including a 1,000-foot realignment at the highest point on the east road near the 15-mile post from the Lake) and between 20½ and 23½ miles from the Lake.

Graveling.—The road was graveled over about one-quarter of a mile between the Lake Junction and the Yellowstone River bridge; over the 2 miles between the 3 and 5-mile posts from the Lake Junction, and for 1 mile between the 7 and 8-mile posts from Lake Junction. Both of the first two stretches needed graveling very badly, having during the rains of May and June this year become all but impassable.

Turnout at Lake Junction.—A turnout was built at the Lake Junction, completing a triangle at this point and connecting the east road with the branch of the belt line leading to the north or in the direction of the Canyon. Previously the junction had consisted of a single turnout from the east approach to the south branch of the belt line, making the turn for traffic from the north belt line onto the east road so sharp that freight wagons could not make it, but were compelled to pass to a point beyond where they could turn completely around and then enter the east road from the south.

Bridges and culverts.—A new log bridge of 20-foot span was built at the crossing of the realignment over Cub Creek. The bridge at

the outlet to Turbid Lake, about 6½ miles from Lake Junction, was rebuilt, the elevation of the bridge and approaches being made 5 feet higher than originally, thereby eliminating the former sharp descent to the bridge. Minor repairs to other bridges were made where necessary, and a number of galvanized-iron culverts were installed in connection with the other work of improvement. The viaduct or loop bridge on the east slope of Sylvan Pass needs replacing, and the work of so doing has been begun, but will not be completed until next year, work now having been suspended.

IN THE FOREST RESERVE.

Widening, grading, and surfacing.—During the year about 22 miles of the east approach was widened and graded, and surfaced where needed, making a total of 25 miles completed and leaving 2½ miles (between the 6 and 8½-mile posts from the park boundary) yet to be improved. A large amount of very heavy rockwork was involved in this section, especially the half farther from the park. The work also included several realignments as follows: One about one-quarter of a mile long, 900 feet of which was along a rock cliff, 2½ miles from the park boundary; one 6,000 feet long at Holm Lodge and Libby Flats, between 8 and 10 miles from the boundary; and one about 1 mile long at the location of the new steel bridge over the North Fork of Shoshone River, 21½ miles from the park boundary.

Steel bridges.—Contracts were let for the steel and erection of three low curved top chord-steel bridges, 100-foot span each, with riveted joints, located as follows: Two over the North Fork of the Shoshone River, 2 and 21½ miles, respectively, from the park boundary, and one over Elk Fork, 23 miles from the boundary. The concrete abutments and floors of these bridges are being built by the Government. At this date the Elk Fork bridge is practically completed except for the floor, and the abutments for the two bridges over the North Fork are about half completed.

Other bridges and culverts.—Minor repairs were made where necessary to other bridges and culverts, and a number of galvanized iron culverts were installed in connection with the other work of improvement.

COOKE CITY ROAD.

General improvement.—The work begun last year of widening and improving the road leading from Tower Falls to the northeast boundary, known as the Cooke City Road, was continued during the summer of 1915. The road was widened for about 4 miles and graveled an aggregate distance of about 2 miles, where most needed; and about 65 log bridges and culverts of various spans were installed. About 7 miles of road, beginning at the northeast boundary, has now been placed in very fair condition.

Work by Robert I. McKay.—In addition to the work done at Government expense on the Cooke City Road, there has been some work done by Mr. Robert I. McKay and associates, who have considerable mining interests at Cooke City, Mont., about 4 miles outside the northeast boundary. As Mr. McKay has a permit from the Interior Department to operate motor trucks and trailers through the park from Cooke City to Gardiner, Mont., for the purpose of

hauling ore, machinery, etc., he and his associates are interested in the upkeep and improvement of the road. The principal work done by these interests to date consists of a realignment, 3,600 feet long, around what is known as the Ash Grade and S Hill, between 8 and 9 miles from the northeast boundary. This realignment slightly shortened the road and eliminated a hill with a 130-foot climb, having an average road grade of about 6½ per cent and a maximum grade of about 19 per cent. The work included the removal of considerable rock, boulders, gravel, etc., by blasting, the building of some crib retaining wall, and the construction of a 10-foot log bridge and five 3-foot and three 4-foot log culverts. In addition, some work was done not on the realignment mentioned, including the building of two log culverts of about 4-foot span each, and the replacing of a 21-foot span log bridge over Lost Creek, a short distance beyond Tower Falls toward Cooke City. At present work is being done by Mr. McKay and his associates on a realignment around a bad hill west of Pebble Creek, about 11 miles from the northeast boundary, on a realignment between the Soda Butte flat and the Jackson grade, about 14½ miles from the boundary; and on graveling considerable portions of the road.

WORK IN GENERAL.

Telephone lines.—The opening of the park to automobiles on August 1 made essential an improved telephone service throughout the park. Sixty-three miles of new single-wire telephone line was built by the Engineer Department, which is being paid for by the Interior Department. There was repaired or rebuilt, in addition, 75 miles of telephone line, also at the expense of the Interior Department, excepting a small portion which was paid for by the Engineer Department.

Checking stations.—There were built during the year, for the use of and at the expense of the Interior Department, three automobile checking stations, of log construction, located, respectively, at the west entrance, at the Madison Junction, 13½ miles from the west entrance, and at the north junction of the Mount Washburn and Dunraven Pass Roads.

Automobile truck.—In line with the opening of the park to automobiles on August 1, 1915, there was purchased by the Engineer Department a 5-ton automobile truck. This has effected a large saving in the cost of the freight hauled by the truck. With the hoped-for extension next year of this method of transportation there will be effected a very considerable economy in the matter of hauling freight, which has always been a serious item in the costs of work done in the park.

Storehouse at Madison Junction.—A substorehouse for the Engineer Department, 108 feet long by 38 feet wide, of log construction, was built during the summer of 1915 at the junction of the Firehole, Gibbon, and Madison Rivers, about 13½ miles from the west boundary, to be used principally for the storage of forage purchased in the fall, when the prices are most reasonable.

Gasoline storage tank.—Owing to the large increase in the amount of gasoline engine-driven plant it became advisable to build a 10,000-

gallon capacity steel storage tank at Mammoth Hot Springs, thus enabling gasoline to be purchased by the tank carload, and saving about 35 per cent over the cost of the same when purchased in barrels or drums.

FISH.

The usual season's work of collecting eggs of the black-spotted trout and distributing them from the subhatchery on Yellowstone Lake to points throughout the United States was continued under the direction of the superintendent of the United States hatchery at Bozeman, Mont., Mr. W. T. Thompson, who also furnished trout for planting in park waters as follows:

May 11, 1915, 15,000 eastern brook trout in Blacktail Deer Creek, and the same number on the same date in Obsidian Creek. The usual plants of the surplus black-spotted trout were also made in park waters adjacent to the lake.

A pamphlet on "The Fishes of the Yellowstone National Park," Bureau of Fisheries, Document 818, printed in 1915, has been furnished for distribution during the past season and has proven a very popular and useful document to those interested in fishing in the park.

WILD ANIMALS.

Frequent rains throughout the summer, causing constant growth of grass, provided an abundance of pasture for all kinds of herbivorous animals. And on account of the cool weather due to the rains, elk, deer, and antelope remained in lower altitudes than usual, and were consequently often seen by tourists along the regular stage routes.

ANTELOPE.

The woven-wire fence along the north line of the park near the northern entrance kept the antelope from leaving the park by drifting down the Yellowstone River, as they are inclined to do during severe storms if allowed to follow their own instincts. They were fed whenever necessary during the winter from the alfalfa hay raised on the field near the entrance arch, and while the winter was so open and the herd so scattered that an accurate count was not secured they were all in fine condition in the spring, and there is no doubt that there was a normal increase in the herd. Last fall there were 192 tons of alfalfa hay on hand for use during the winter in feeding the antelope, mountain sheep, and deer. As the winter was very mild it was necessary to feed but 80 tons, leaving 112 tons that were carried over to this year. During the summer the 45½-acre field has been kept watered and has been cut twice and the hay, amounting to 82½ tons, stacked for next winter. A part of the field has grown up enough so that it will be cut again, so there are something over 200 tons of hay in stack for the coming winter. This field was cared for and hay cut and stacked under contract this season at a cost of $5 per ton for the hay in stack. The same work cost $6.09 per ton season of 1914.

DEER.

While due to the open winter the deer were not in evidence in large herds as they are sometimes found, there seemed to be at least the usual numbers of both black-tailed and white-tailed varieties, and they were in splendid condition all winter Deer are frequently killed in open season by hunters several miles outside of the park, and I am convinced that many of them stray over the boundaries of the park annually.

ELK.

The weather was so mild and there was so little snow in March and April that the elk went up to high ground earlier than usual, and it was impracticable to take an accurate census of them. They were all in splendid condition, however, and careful estimates by experienced men placed the increase in the northern herd at 10 per cent and the decrease from natural causes at 3 per cent. Taking this into consideration, and deducting 375 elk shipped out of the park under authority of the department during the winter of 1914–15 leaves an estimated total of 37,192 in the herd. Those shipped were consigned as follows: January 25, 2 crated by express to the city park at Columbia, S. C.; January 27, 4 crated by express to the park commissioner, Borough of Queens, N. Y.; January 29, 3 crated by express to the mayor of St. Joseph, Mo.; February 12, 50 in 2 cars by freight to the State game warden of New Mexico; February 15, 50 in two cars by freight to the State of Montana; February 19, 50 in two cars by freight to the State of Idaho; February 21, 50 by express in a large express car to the State of South Dakota; February 24, 2 by express, crated, to Little Falls, Minn.; February 26, one car of 25 by freight to the State of Michigan, one car of 30 yearlings by freight to the State of Wisconsin, and 4 for the New York Zoological Society in the car by freight with elk for Michigan as far as St. Paul where they were crated and shipped the balance of the journey by express; March 3, 50 in a large car by express to the State of Colorado by the United States Biological Survey; March 5, one car of 25 by freight to the State of Utah by the United States Biological Survey; and the last shipment, on March 12, of one car of 30 by freight to the State of Minnesota. Allotments of elk for some other States were not filled on account of quarantine regulations for foot-and-mouth disease, which was prevalent in various sections during the winter. Unusual difficulty was found in capturing the elk wanted for shipment, as they did not come down for hay, on account of the warm winter. The experiment of shipping elk in carload lots by express, in the cases of South Dakota and Colorado, proved very satisfactory, as the animals receive better care than when shipped by freight, are not so long on the road, and with 50 in one large car the cost of shipping should not be much greater than if shipped in carloads of 25 by freight. In shipping by freight, rough handling of the cars by the railroads often results in considerable loss. Mr. F. M. Dille, who had charge of the shipment of the allotments made through the Department of Agriculture, is of the opinion that the method of shipment by express is far better than by freight. The presence of several bands of wolves has recently been noted on the elk ranges,

and it is feared that they will kill many of the calves. Arrangements are now being made to systematically hunt the wolves and coyotes in the park.

MOOSE.

Moose are frequently seen in various sections of the park. They are reported as thriving and increasing in numbers.

BUFFALO.

WILD HERD.

Little has been seen of this herd for the past two years, and it has not been practicable to get an accurate count of them.

TAME HERD.

The tame herd, which is kept on Lamar River near the mouth of Rose Creek, 30 miles east from headquarters, has been in the best of condition during the year. This herd now numbers 239 animals, as follows:

	Males.	Females.	Total.
Number Oct. 1, 1914 (last report)	96	97	193
Born in November, 1914	1	.....	1
Born summer of 1915	28	21	49
Total to account for	125	118	243
Died or disposed of during the year	3	1	4
Balance now in the herd	122	117	239

Of those disposed of one 5-year-old bull was donated by the department to the city of St. Joseph, Mo., and shipped at the expense of the city on January 4; one 6-year-old bull was killed in the herd April 5; one yearling bull was found dead on the range, apparently from eating poisonous weeds, the latter part of June, and one 6-year-old cow died September 17.

The herd is kept out on the range most of the time during the summer months. Several attempts have been made to drive a number of the old bulls out to the range of the wild herd and to get them together, but they always return to the main herd. The usual show herd of 15 bulls was brought in to Mammoth Hot Springs on June 15 and returned to the main herd on September 20. At the present rate of increase in the herd it will soon become necessary to dispose of a large number of them or provide additional facilities for their care. The herd would be in much better shape if at least a hundred of the bulls could be disposed of. About 200 acres of meadow land was kept watered during the summer, and the hay was cut and stacked in August, yielding about 150 tons, at a cost for cutting and stacking of $5.08 per ton. About 70 tons of last year's crop of hay is still on hand, and it is expected that 20 to 30 tons of good hay will be cut and stacked from a field sowed to oats last spring. This will insure an adequate supply of forage for the winter. Last winter being an open one, it was not necessary to begin feeding hay until January 26.

BEARS.

But few complaints were received during the summer of depredations by bears. Travel being heavy they found an ample supply of food at the garbage dumps near hotels and permanent camps, and therefore did not have to resort to stealing from ice boxes and camper's supplies, as is sometimes the case. Two bears had to be killed during the summer to protect life and property.

A 5-year-old male grizzly bear was captured at Grand Canyon and shipped alive on November 2, 1914, to the Board of Park Commissioners at Kansas City, Mo., at their expense. Two grizzlies, male and female 2-year-olds, were captured at Grand Canyon and shipped to the city of Los Angeles, Cal., on September 16 at the expense of the city.

COYOTES AND WOLVES.

Coyotes are numerous, although they are much hunted during the winter by employees on duty in the park. About 100 were killed during the year. Gray wolves are increasing, and have become a decided menace to the herds of elk, deer, mountain sheep, and antelope. Several were killed in the park last winter, and an effort will be made the coming winter to capture or kill them.

MOUNTAIN LIONS.

Mountain lions are numerous and are in evidence during the winter, when their tracks are found in abundance in the vicinity of the large herds of elk. None were killed last winter, as there was not enough snow to track them to cover.

MOUNTAIN SHEEP.

The mountain sheep, like the deer and antelope, were considerably scattered during the winter, as the weather was mild, grass plentiful, and there was scarcely any snow to drive them down to the lower altitudes. They were apparently plentiful and wintered in excellent condition.

OTHER ANIMALS.

Other smaller animals usually found in this altitude, such as beaver, foxes, lynx, otter, marten, etc., are frequently seen.

BIRDS.

Many kinds of birds are found in the park, and all, more particularly those classed as game birds in the States, are noticeably tamer than they are outside of the park. They, as well as many of the wild animals, seem to know where the park lines are located, although many hunters have complained that these lines are not marked plainly enough. The interest of travelers in bird life in the park has increased noticeably since the publication of a list of the names of birds found in the park in the circular of information which is generally distributed to all.

PROTECTION OF GAME.

The question of game protection in the park has been much simplified of recent years by the hearty cooperation of the authorities of the adjoining States and of the officials of the national forests which adjoin the park on all sides. The States also establish game preserves in many places adjoining the park, changing their boundaries as conditions demand. Last winter the Montana Legislature withdrew from the game preserve that section immediately west of the northwest corner of the park, thus opening up a good hunting region for elk and deer, but still retain as a preserve that section just north of the park extending from the northwest corner to the mouth of Gardiner River. It also extended the season for hunting elk and deer to December 15, so as to enable those who depend upon the fall hunt for a winter supply of meat to get it late enough in the fall so it will not spoil. Hunting has been very poor during the last two seasons, as cold, stormy weather did not come in time to drive the elk down before the close of the hunting season. Last winter the Wyoming State Legislature set aside a large part of the area east of the park as a game preserve.

Additional scouts were employed during the hunting season in adjoining States, and several arrests were made; but in few cases were the parties indicted, and under the present law it is an expensive and difficult process to prosecute offenders, as under a decision of the Attorney General the United States commissioner in the park can not dispose of a case but can only hold violators of the park laws to trial before the United States district court. In most cases where evidences of depredations were found the guilty parties were discovered and brought to trial. One violator of the law—a soldier who was a member of the detachment stationed in the southwest corner of the park—pleaded guilty to the charge of killing an elk in the park, before a general court martial, and was sentenced: "To be dishonorably discharged the service of the United States; to forfeit all pay and allowances now due, or to become due while in confinement under this sentence; and to be confined at hard labor at such place as the reviewing authority may direct for one and one-half years." The United States Disciplinary Barracks, Alcatraz, Cal., was fixed by the reviewing authority as the place where the sentence would be served.

Seventeen snowshoe cabins were put in repair and supplied for the use of patrols traveling on skis during the winter.

VIOLATIONS OF LAW.

Several violations of law were discovered, in addition to those protecting game, and in many cases arrests have been made.

In February, the evening of the first or morning of the second, some miscreant cut the high woven-wire fence on the north line of the park, about 3½ miles west from the entrance arch. Tracks of a man were found leading away from the point where the fence had been cut, but it was impossible to fix the blame. On the evening of February 3 some one went to the pens, at the haystacks on the flat, in sight of the town of Gardiner, and killed five of the elk that had been captured for shipment. It was apparent that the elk had been killed

with a large knife tied to a long stick, from the outside of the pen. As scarcely any of the meat had been taken, it appeared likely that the work was done by some one for spite, possibly by the same persons who cut the fence. Efforts were made to fix the blame, but so far they have been fruitless.

A highway robbery occurred about 10 o'clock a. m., July 9, at a point about a mile south of Madison Junction, on the road toward Fountain. The day was very rainy; and being one of the days of heavy travel from the western entrance, about 12 miles of passenger vehicles were in the line leaving Yellowstone that morning. After one vehicle had passed without being molested five were held up and the passengers forced to give up some of their money. The robber, who was masked and carried a rifle, was described by all who saw him as evidently an amateur in the business, and he was doubtless frightened away before he had completed the job by seeing a man from one of the rigs pulling up from the rear drop off, and go back on the road to give the alarm. Had he continued a few minutes longer he would have been captured in the act, as soldiers were at the scene within about half an hour. The alarm was at once given and all available men from stations and scouts from headquarters were at once sent out, some to the scene of the holdup to try and pick up some trail or bit of evidence and others to cover trails, roads, etc., leading out of the park. The country was searched for two days for several miles around, but not a trace or clue was found. This, however, might easily have been due to the excessive rain that day, which completely obliterated all tracks. Suspicion rested on some near-by road camps, where many men of unknown character were employed as laborers, and as they did not work the morning of that day on account of the rain it was a difficult job to check and account for them. Later the Department of Justice sent detectives to the scene, who still have the matter in hand and are following clues. The total amount secured by the robber is less than $200.

Through the efforts of the secret-service men of the Department of Justice a man is now being held in jail charged with the crime of holding up the coaches in the park on July 29, 1914, and it is believed that the evidence is strong enough to convict him.

SANITATION.

During the tourist season frequent inspections of hotels and camps were made by officers of my command with a view to keeping them in the best possible condition of cleanliness. Two men with a two-horse team and wagon were kept on the move all summer keeping the camping grounds in a sanitary condition and caring for the earth closets maintained for public use throughout the park.

Since the admission of automobiles on August 1, a demand has been created for special sanitary camps for parties traveling in private automobiles and carrying their own camp equipment. The regular camps are selected with a view to providing grazing for horses, which also need to be kept at some distance from hotels and permanent camps. A separate set of camps, about three in number, located at Mammoth Hot Springs, Upper Geyser Basin, and Grand Canyon, not too far from the points of interest and provided with a few conveniences, would be appreciated by those who travel in their own automobiles, and as the

automobile tickets of passage, for which a charge is made by the department, are a source of considerable revenue, it seems that an expense for this purpose is warranted.

FOREST FIRES.

Almost constant wet weather during the past summer prevented danger at any time of forest fires, and in few cases were the usual summer fire patrols considered necessary.

IMPROVEMENTS.

Fire lanes.—The crew of men constructing fire lanes in the southeast corner of the park last fall completed about 10 miles of new fire lanes, as far as the crossing of the Yellowstone River, when they discontinued the work on account of bad weather. A total of 31 miles of fire lanes were constructed season of 1914, at an average cost of $60.20 per mile. About June 1 a crew was again put into the field, and during the month of June went over and repaired 75 miles of old fire lanes at an average cost of $18.34½ per mile, the high rate being due to the fact that one of the fire lanes repaired—the one from Soda Butte Creek up Lamar River and down Pelican Creek to Mary Bay, 48 miles in length—had not been repaired for several years and needed more work than usual. Since July 1 this crew has repaired 154 miles of fire lanes at an average cost of $10.23 per mile, and built a new fire lane from the crossing of the Upper Yellowstone River west as nearly as practicable along the south boundary, to connect with the one built last season, 6 miles northeast of Snake River Station, a total of 27 miles, at a cost of $32.12 per mile. All fire lanes were gone over and repaired during the season, except the one from Snow Pass to the Gallatin road, through Fawn Pass, a distance of 24 miles.

The wire fence around the pasture at Mammoth Hot Springs, used in summer for the show herd of buffalo bulls, was repaired in April and May, requiring 70 new cedar posts to replace those that had rotted off. Two thousand seven hundred feet of this fence was taken down and moved in, to get it away from the stage road from Tower Falls to Mammoth, and this required 135 new posts. Due to change of location, it took 3,000 feet of fencing to replace the 2,700 feet taken down. Most of this work was done by regular employees.

A new log house was built at the mouth of Rose Creek on Lamar River, for use of the buffalo keeper. It is built of logs with shingle roof, finished inside with beaver board. The main part is a one-story building 30 by 30 feet, with porch over the front door, brick chimney in the center, and is divided into dining room 15 by 15 feet, living room 15 by 15 feet, and three bedrooms each 10 by 15 feet. Built on the same line in front is an addition 12 by 14 feet, one story built of logs, with brick chimney, and porch on the back side over the door. This work has all been done by park employees, in addition to their regular duties, and has only recently been completed. The cost of the material was $654.19.

Telephone lines.—Under a decision by the Comptroller of the Treasury that the Interior Department may improve and extend the park telephone system which was built at the expense of the War Depart-

ment, the sum of $10,000 was allotted for the extension and repair of the system, in connection with the opening of the park to automobiles.

The engineer officer in charge of road improvements in the park found that he was badly in need of efficient telephone service in connection with his work of building and repairing roads, and he was permitted to install telephones on the park line at all of his principal road camps in the park, greatly facilitating his work. He also secured a small allotment of funds from the road appropriation for keeping up the line, and he has kindly had all of the work on the lines done by his crews, under his supervision and mine, bills to be paid by this department except for a small portion which is covered by his allotment. By this cooperation, expense is reduced, and the telephones installed in the road camps are also frequently very convenient for use of our patrols in making reports and in checking automobiles. It was over a telephone in one of the engineer camps that the first news of the holdup of July 9 was received at headquarters, several minutes earlier than it would have been received from the nearest soldier station.

The material necessary for the extension and repair of these lines was purchased by special authority from the Signal Corps of the Army, at a minimum figure, and shipped on a Government bill of lading from Omaha, Nebr. The work completed during the summer was as follows:

A new line from Norris, via Canyon to Lake Outlet, 27 miles, at a cost of about $120 per mile. A new line from the western entrance of the park to Firehole Cascades, where it connects with the Norris-Upper Basin line, a total of about 16½ miles, at an approximate cost of $172 per mile for the first 9½ miles from the west boundary, and about $119.50 per mile for the remaining 7 miles. A new line from Canyon to Tower Falls Soldier Station, about 20 miles, at a cost of about $106 per mile. The building of these new lines made the Government lines, which had heretofore been carried on poles of the hotel company between Norris and Lake Outlet, and on the poles of the Yellowstone-Western Stage Co. to the west boundary, entirely independent, and established communication between Canyon and Tower Falls via Dunraven Pass, necessary in checking automobiles. Repairs were also made to telephone lines as follows:

Norris to Upper Basin, about 29 miles, at an approximate cost of $52 per mile. Thumb to Lake Outlet, about 16 miles, at an approximate cost of $60 per mile. About 12 miles of the line east from Lake Outlet toward Sylvan Pass Station, at an approximate cost of $72.50 per mile. And the line from Tower Falls Station to Headquarters, 18 miles, at an approximate cost of $44.60 per mile. No repair work was done on the balance of the Sylvan Pass line, on the line from Thumb to Bechler Station via Snake River Station, or from Swan Lake flats to Gallatin Station, except slight repairs made by park employees or enlisted men. The lines from Fort Yellowstone to Gardiner, and from Fort Yellowstone to Norris have been kept in repair by enlisted men.

Checking stations.—Under allotments from park revenues, stations for checking automobiles were constructed as follows: A log building 14 by 14 feet at the west boundary entrance, with tarred paper and gravel roof, at an approximate cost of $200; a similar building at a cost of about $100 at the north end of Dunraven Pass about 11 miles

from Canyon Junction; and a log building 14 by 28 feet inside measurements, with shingled roof, at Madison Junction, 14 miles from the west boundary, at a cost of about $250. The engineer officer also kindly had this work done by his crews who were on the ground, thus saving considerable expense of moving special crews out long distances to those points. Additional checking stations were authorized, but were not found necessary during the short season for automobiles since August 1. The Engineer Department buildings at Beaver Lake, between Fort Yellowstone and Norris, and at De Lacy Creek, between the Upper Basin and Thumb, were also used as checking stations.

With permission of the department, the Engineer Department built a short spur of railroad track into the park from the Oregon Short Line Railroad depot at Yellowstone, Mont., for the purpose of switching and unloading road oil into their storage tank at that point.

The military authorities have torn down and destroyed the old barracks and stables originally known as Camp Sheridan, located close to the road opposite Jupiter Terrace, thereby greatly improving the appearance of the landscape at that point.

NATURAL PHENOMENA.

Few changes of any importance have been noted in the geysers, hot springs, etc., during the past year.

An earthquake was noted at 7.55 a. m. on May 8. Three distinct shocks were noticed at Grand Canyon and Tower Falls, and one was noticed at Mammoth Hot Springs. No damage was done.

CONCESSIONS.

CONCESSIONERS HOLDING PRIVILEGES FOR A YEAR OR MORE IN YELLOWSTONE NATIONAL PARK UNDER EXISTING CONTRACTS, WITH RENTALS AND OTHER TAXES EXACTED.

Yellowstone Park Hotel Co.—Contracts (two) dated February 26, 1913, run for period of 20 years, and grant to company right to use certain land in the park and erect and maintain thereon hotels and necessary buildings connected therewith.

Annual rental: Forty dollars per acre on 29.44 acres, $1,177.60. News-stand privilege at hotels and lunch stations, $750. Usage tax, 1915, 25 cents per capita on guests during 1915 season, $6,722.

Yellowstone Park Transportation Co.—Contract dated February 26, 1913, runs for period of 20 years, and authorizes company to establish and maintain a stage and transportation line and agrees to lease necessary land at eight designated sites on which to construct and maintain buildings required for accommodation of stock, carriages, employees, etc.

Annual rental: Forty dollars per acre on 27.16 acres, $1,086.40. Usage tax, 1915, 25 cents per capita on passengers carried during 1915 season, $1,655.25.

Yellowstone Park Boat Co.—Contract dated February 7, 1913, runs for 10 years, and lease dated May 19; 1914, for 9 years from February 7, 1914, grants to company privilege of maintaining, operating, and conducting on Yellowstone Lake and such other park lakes as may be designated, motor boats and launches, motor vessels, rowboats, and dories for accommodation of tourists, with right to sell and rent fishing tackle and sell fruits, nuts, confectionery, books, periodicals, cigars, tobacco, and camping supplies, and lease or sell bathing suits. Contract agrees to lease lands on shores of Yellowstone Lake on which wharves and ways are constructed, and at other points to be agreed upon on which to erect buildings for storage of equipment, accommodation of employees, etc.

Compensation for boat privilege, $100 per annum. Annual rental on 1.8592 acres, at $40 per acre, $74.37.

Wylie Permanent Camping Co.—Contract of May 4, 1906, runs for 10 years from March 31, 1906, and grants transportation privilege in park, with sites for maintenance of permanent camps therein, and right to conduct lunch stations at points near Gibbon River and West Thumb of Yellowstone Lake.

Annual rental: Ten dollars per wagon (not less than 50 to be used) on 158 wagons used during 1915 season, $1,580. News-stand privilege at permanent camps, $500. Usage tax, 1915, 50 cents per capita on passengers carried during 1914 season, $2,376.50.

Shaw & Powell Camping Co.—Special permanent camping license issued April 19, 1913, and running for a period of one year from May 1, 1913, or until such time as may be revoked, authorizes it to maintain, conduct, and carry on the business of transporting tourists in and through the park and provide for their accommodation at permanent camps to be established on sites at designated points in the reservation and to maintain a lunch station on Madison River between the present Wylie camp and the State line.

Annual rental: Ten dollars on each wagon used (75 passenger and 10 freight wagons used 1915 season), $850. News-stand privilege at permanent camps, $100. Usage tax, 1915, 25 cents per capita on passengers carried during 1914 season, $606.25.

Holm Transportation Co.—Contract entered into March 14, 1913, with company for the period of one year from and after March 31, 1913, authorizes the establishment and maintenance of a stage and transportation line in the park, with the right to use and occupy such parcels of land as may be necessary at or near designated points therein on which to construct and maintain suitable buildings and inclosures for accommodating stock, carriages, and employees. Supplemental agreement entered into with company on January 23, 1914, extending the contract further for a period of three years from March 14, 1914.

Annual rental: Forty dollars per acre on approximately 1.915 acres, $76.60. Usage tax, 1915, 25 cents per capita on passengers carried during the 1915 park season, $36.

George Whittaker.—Contract dated March 13, 1913, for period of 10 years, grants use on 24,000 square feet of land at or near Mammoth Hot Springs, with privilege of maintaining a dwelling, store, and post office.

Annual charge, $100. Usage tax, 1914, $800 per annum. Total, $900.

Yellowstone-Western Stage Co.—Contract dated January 26, 1915, anuthorizing, for the term from January 1, 1914, to December 31, 1915, establishment and maintenance of a stage and transportation line, and permitting the use of certain parcels of land in connection with such privilege, aggregating 13 acres, together with use of buildings located thereon, approximately 47 in number, for accommodating stock, carriages, and employees.

Rental for period of contract: Forty dollars per acre on 13 acres, $520. For use of buildings, $2,500; 25 cents per capita tax on passengers carried during 1915 park season, $4,934.25.

Pryor & Trischman.—Contract dated August 26, 1908, running for period of eight years, from April 3, 1908, issued to George R. and Anna K. Pryor, interest of former transferred to Elizabeth Trischman through assignment approved by Department of the Interior October 29, 1912, grants use of tract of land near Mammoth Hot Springs in park, containing 13,800 square feet, on which to maintain dwelling, store, and soda fountain.

Annual rental, $50; usage tax of $115 per annum. Total, $165.

C. A. Hamilton.—Contract dated November 23, 1914, running for a period of three years, from August 13, 1914, issued to Mary R. Klamer, widow of Henry E. Klamer, and by her transferred through assignment approved by Department of the Interior June 25, 1915, authorizes use of 2-acre tract of land at or near Upper Geyser Basin, with privilege of maintaining thereon building or buildings for use as dwelling and conduct of a general store.

Annual rental, $100; usage tax, $1,200 per annum. Total, $1,300.

F. Jay Haynes.—Contract of May 25, 1914, for period of three years from April 1, 1914, authorizes use of 0.64 acre of land at Mammoth Hot Springs and 1 acre at or near Upper Geyser Basin, with privilege of maintaining buildings thereon for the preparation and sale of photographic views. Contract also agrees to lease not to exceed 1 acre of land at or near Grand Canyon for buildings for photographic purposes.

Annual rental: Forty dollars per acre on 2.64 acres, $105.60. For privileges accorded, $1,000 at Mammoth Hot Springs, $1,000 at Upper Basin, and $500 at Grand Canyon. Total, $2,605.60.

Henry J. Brothers.—Contract of July 1, 1914, for a perio[illegible] of 10 years from same date authorizes use of approximately 2½ acres of land, at [illegible], $100, to be leased to him at Upper Geyser B[illegible], with privilege of m[illegible]house and bathing pools. Compensation [illegible] privilege, $20[illegible]

Annual r[illegible] also $200 [illegible]nts to begin one [illegible]blic Ju[illegible]

Personally conducted camping party and special licenses issued in the Yellowstone National Park during the season of 1915.

ENTERING AT NORTHERN ENTRANCE.

Name of licensee.	License No.	Usage tax (25 cents per capita on passengers carried 1914 season).		Amount paid, special licenses issued (1 wagon each).	Number of wagons, at $10 each.	Number of horses, at $2 each.	Total paid.
		Number carried.	Amount paid.				
S. E. and E. J. Larson	15,16	22	$5.50	.....	3	1	$37.50
O. O. Rosenborough and H. P. Grant [1]	21,24	93	23.25	.....	11	.....	133.25
Bert Stewart and J. McPherson	12,17	.....	.....	$25.00	1	.....	35.00
Howard Eaton	10,11,43,44	63	15.75	.....	4	51	157.75
Chas. G. Davis	35	.....	.....	25.00	.....	.....	25.00
E. L. Robertson	22	.....	.....	25.00	.....	.....	25.00
Do	23	.....	.....	15.00	.....	.....	15.00
Total	.....	178	44.50	90.00	19	52	428.50

ENTERING AT NORTHERN AND WESTERN ENTRANCES.

W. N. and O. M. Hefferlin [2]	8,9	110	$27.50	.....	42	4	$455.50
B. D. Sheffield	1,37,38	33	8.25	.....	3	3	44.25
Total	.....	143	35.75	.....	45	7	499.75

ENTERING AT WESTERN ENTRANCE.

T. E. Newcomb	29	4	$1.00	.....	.....	18	$37.00
Joe Clause	13,14	32	8.00	.....	3	2	42.00
Total	.....	36	9.00	.....	3	20	79.00

[1] Roseborough and Grant had special permission to erect a permanent storage camp at Apollinaris Spring, but did not avail themselves of it.

[2] W. N. and O. M. Hefferlin had special authority for season 1915 for four permanent camps for their patrons, which they erected and operated.

ENTERING AT EASTERN ENTRANCE.

Name of licensee.	License No.	Usage tax (25 cents per capita on passengers carried 1914 season).		Number of wagons, at $10 each.	Number of horses, at $2 each.	Total paid.
		Number carried.	Amount paid.			
J. W. Howell	39,40	.....	.....	1	6	$22.00
Frederick Morris	41,42	9	$2.25	1	8	28.25
H. Mullendore	2,3	.....	.....	2	2	24.00
Will B. Shore and Geo. T. Hopkins	6,7,20,25,30	40	10.00	5	28	116.00
N. W. Frost and Fred J. Richard	34	.....	.....	.....	24	48.00
W. H. Jordan	4,5,46	41	10.25	1	9	38.25
E. C. Brown and Simon Snyder	18,19	26	6.50	5	20	96.50
Total	.....	116	29.00	15	97	373.00

ENTERING AT SOUTHERN ENTRANCE.

C. E. Carrington	36	.....	.....	.....	12	$24.00
James S. Simpson	26,27	.....	.....	1	6	22.00
Chas. C. Moore	31,32	15	$3.75	2	14	51.75
S. N. Leek	33	5	1.25	.....	11	23.25
Total	.....	20	5.00	3	43	121.00

ENTERING AT SOUTHERN AND EASTERN ENTRANCES.

Joe A. and M. G. Jones and Joseph McGill	28,45	3	$0.75	.....	32	$64.75
Total	.....	3	.75	.....	32	64.75

Personally conducted camping party and special licenses issued in the Yellowstone National Park during the season of 1915—Continued.

SUMMARY (ALL PARK ENTRANCES).

Park entrance.	Usage tax (25 cents per capita passengers carried 1914 season).		Amount paid special licenses issued.	Number of wagons at $10 each.	Number of horses at $2 each.	Total paid.
	Number carried.	Paid.				
Licensees entering at northern entrance and at both northern and western entrances combined	321	$80.25	$90.00	64	59	$228.25
Licensees entering at western entrance	36	9.00		3	20	79.00
Licensees entering at eastern entrance	116	29.00		15	97	373.00
Licensees entering at southern entrance and at both southern and eastern entrances combined	23	5.75		3	75	185.75
Total	496	124.00	90.00	85	251	1,566.00

RECOMMENDATIONS.

That it be decided for a definite period of time by the department maintaining the military force and that controlling the national park if the park shall continue to be policed by United States troops or if they shall in the near future be replaced by a civilian organization. A fixed policy in this regard is essential to a stable and progressive administration.

Very respectfully,

LLOYD M. BRETT,
Colonel of Cavalry, Acting Superintendent.

The SECRETARY OF THE INTERIOR.

APPENDIX.

RULES AND REGULATIONS.

Regulations of October 24, 1915, governing the distribution of animals from the Yellowstone National Park during the fiscal years 1914–15.

1. *General.*—Distribution of all animals will be limited to applications from Federal, State, county, and municipal authorities. None will be given to private parties. Allotments will be made in the order of receipt of applications, but preference will be given to shipments intended for National reservations and to those States not having theretofore received animals. Before elk will be allotted evidence must be furnished that the laws of the State where they are intended to be transported afford them complete protection during the close as well as the open season. In the case of all animals assurance must be given that they will be humanely and properly cared for.

2. *Expense.*—No charge will be made for animals, but applicants will be required to bear all expense of capture, crating, and hauling to Gardiner, Mont., the shipping point, and to arrange for payment of transportation charges from that place to point of destination. Provision should be made for an attendant to accompany elk shipped by freight in carload lots. Small consignments of elk or other animals should be forwarded by express, and arrangements should be made for suitable crates in which to transfer animals from car to place of destination.

3. *Elk.*—During the present fiscal year the total number of elk to be distributed will not exceed 1,000, and not more than 50 head will be allowed to any one State.

In view of the existence of several peculiar forms of elk on the Pacific coast, and the importance of keeping these elk distinct from the Rocky Mountain species, requests for elk intended for the Cascades, Sierra Nevada, or points west of these ranges will not receive approval.

In shipping elk by carload the number of head in any one car shall not exceed 30. This number will be permitted only in the case of yearlings shipped in a 36-foot car; in all other cases the number of elk shall not exceed 25 head per car. When cattle cars are used for the shipment of elk the lower part of the car must be covered with burlap, canvas, or some similar material to screen the animals from view and prevent them from being disturbed at stations en route. When box cars are used the doors should be left partly open for ventilation. Before shipping the elk all cars must be padded inside to a height equal to the shoulders of the animals. Ample arrangements must be made to provide food and water when cars are likely to be more than 12 hours en route. When-

ever possible the elk should be fed and watered within the car; otherwise shipments will be governed by the 28-hour law (act of Congress of June 29, 1906, 34 Stat., 607). When convenient snow should be furnished the elk instead of water, and tubs containing water or snow must be placed at the ends as well as in the middle of the car. Two partitions, one on each side of the door, must be provided as a place for food and water.

4. *Buffalo.*—A limited number of the older bulls from the tame herd will be distributed to such municipal parks—not more than two to any one park—the authorities of which will defray all expense of crating, hauling to cars, and transporting, and upon the further condition that at least two buffalo cows will be procured for each bull donated. Cows from the park herd will not be disposed of under any conditions.

5. *Beaver.*—A limited number of beaver will be distributed to points where the animals will have complete protection and where conditions are favorable for their increase.

6. *Bears.*—Bears, not to exceed two for any public park or zoological garden, may be shipped when properly crated.

7. *Other animals.*—Antelope, deer, moose, and mountain sheep will not be distributed at this time, owing to their limited numbers.

Applications should be addressed to the Secretary of the Interior, Washington, D. C.

GENERAL REGULATIONS APPROVED MAY 27, 1911.

The following rules and regulations for the government of the Yellowstone National Park are hereby established and made public pursuant to authority conferred by section 2475, Revised Statutes United States, and the act of Congress approved May 7, 1894:

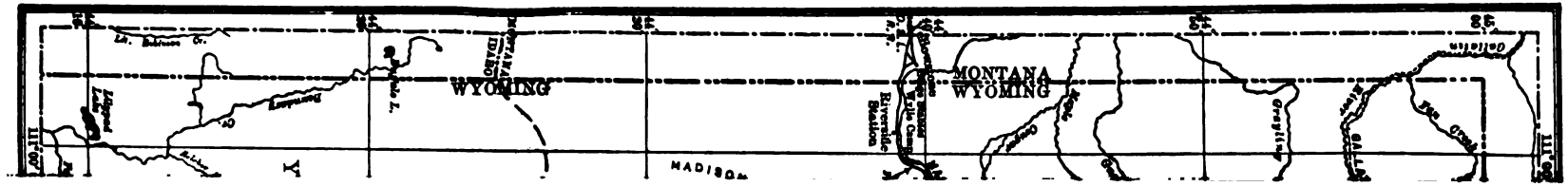
1. It is forbidden to remove or injure the sediments or incrustations around the geysers, hot springs, or steam vents; or to deface the same by written inscriptions or otherwise; or to throw any substance into the springs or geyser vents; or to injure or disturb in any manner or to carry off any of the mineral deposits, specimens, natural curiosities, or wonders within the park.

2. It is forbidden to ride or drive upon any of the geyser or hot-spring formations, or to turn stock loose to graze in their vicinity.

3. It is forbidden to cut or injure any growing timber. Camping parties will be allowed to use dead or fallen timber for fuel. When felling timber for fuel, or for building purposes when duly authorized, stumps must not be left higher than 12 inches from the ground.

4. Fires shall be lighted only when necessary, and completely extinguished when not longer required. The utmost care must be exercised at all times to avoid setting fire to the timber and grass.

5. Hunting or killing, wounding or capturing any bird or wild animal, except dangerous animals when necessary to prevent them from destroying life or inflicting an injury, is prohibited. The outfits, including guns, traps, teams, horses, or means of transportation used by persons engaged in hunting, killing, trapping, ensnaring, or capturing such birds or wild animals, or in possession of game killed in the park under other circumstances than prescribed above, will be forfeited to the United States, except in cases where it is shown by satisfactory evidence that the outfit is not the property of the person


WYOMING
MONTANA
WYOMING
Riverside Station
Yellowstone
Gallatin
Madison
Lt. Bottom Cr.
Lt. Yellowstone
Lt. Yellowstone
Lt. Yellowstone

or persons violating this regulation, and the actual owner thereof was not a party to such violation. Firearms will only be permitted in the park on written permission from the superintendent thereof. On arrival at the first station of the park, guard parties having firearms, traps, nets, seines, or explosives will turn them over to the sergeant in charge of the station, taking his receipt for them. They will be returned to the owners on leaving the park.

6. Fishing with nets, seines, traps, or by the use of drugs or explosives, or in any other way than with hook and line is prohibited. Fishing for purposes of merchandise or profit is forbidden. Fishing may be prohibited by order of the superintendent of the park in any of the waters of the park, or limited therein to any specified season of the year, until otherwise ordered by the Secretary of the Interior.

7. No person will be permitted to reside permanently or to engage in any business in the park without permission, in writing, from the Department of the Interior. The superintendent may grant authority to competent persons to act as guides and revoke the same in his discretion, and no pack trains shall be allowed in the park unless in charge of a duly registered guide.

8. The herding or grazing of loose stock or cattle of any kind within the park, as well as the driving of such stock or cattle over the roads of the park, is strictly forbidden, except in such cases where authority therefor is granted by the Secretary of the Interior. It is forbidden to cut hay within the boundaries of the park excepting for the use of the wild game and such other purposes as may be authorized by the Secretary of the Interior or the park superintendent.

9. No drinking saloon or barroom will be permitted within the limits of the park.

10. Private notices or advertisements shall not be posted or displayed within the park, except such as may be necessary for the convenience and guidance of the public upon buildings on leased ground.

11. Persons who render themselves obnoxious by disorderly conduct or bad behavior, or who violate any of the foregoing rules, will be summarily removed from the park, and will not be allowed to return without permission, in writing, from the Secretary of the Interior or the superintendent of the park.

12. It is forbidden to carve or write names or other things on any of the mileposts or signboards or any of the platforms, seats, railings, steps, or any structures, or any tree in the park.

Any person who violates any of the foregoing regulations will be deemed guilty of a misdemeanor, and be subjected to a fine as provided by the act of Congress approved May 7, 1894, "to protect the birds and animals in Yellowstone National Park and to punish crimes in said park, and for other purposes," of not more than $1,000, or imprisonment not exceeding two years, or both, and be adjudged to pay all costs of the proceedings.

INSTRUCTIONS APPROVED APRIL 15, 1914.

1. The feeding, interference with, or molestation of any bear or other wild animal in the park in any way by any person not authorized by the superintendent is prohibited.

2. *Fires.*—The greatest care must be exercised to insure the complete extinction of all camp fires before they are abandoned. All ashes and unburned bits of wood must, when practicable, be thoroughly soaked with water. Where fires are built in the neighborhood of decayed logs, particular attention must be directed to the extinguishment of fires in the decaying mold. Fire may be extinguished where water is not available by a complete covering of earth, well packed down.

Especial care should be taken that no lighted match, cigar, or cigarette is dropped in any grass, twigs, leaves, or tree mold.

3. *Camps.*—No camp will be made at a less distance than 100 feet from any traveled road. Blankets, clothing, hammocks, or any other article liable to frighten teams must not be hung at a nearer distance than this to the road. The same rule applies to temporary stops, such as for feeding horses or for taking luncheon.

Many successive parties camp on the same sites during the season, and camp grounds must be thoroughly cleaned before they are abandoned. Tin cans must be flattened and, with bottles, cast-off clothing, and all other débris, must be deposited in a pit provided for the purpose. When camps are made in unusual places, where pits may not be provided, all refuse must be hidden where it will not be offensive to the eye.

4. *Concessionaires.*—All persons, firms, or corporations holding concessions in the park must keep the grounds used by them properly policed and maintain the premises in a sanitary condition to the satisfaction of the superintendent.

5. *Bicycles.*—The greatest care must be exercised by persons using bicycles. On meeting a team the rider must stop and stand at side of road between the bicycle and the team—the outer side of the road if on a grade or curve. In passing a team from the rear the rider should learn from the driver if his horses are liable to frighten, in which case the driver should halt and the rider dismount and walk past, keeping between the bicycle and the team.

6. *Fishing.*—All fish less than 8 inches in length should at once be returned to the water with the least damage possible to the fish. Fish that are to be retained must be at once killed by a blow on the back of the head or by thrusting a knife or other sharp instrument into the head. No person shall catch more than 20 fish in one day.

7. *Dogs.*—Dogs are not permitted in the park.

8. *Grazing animals.*—Only animals actually in use for purposes of transportation through the park may be grazed in the vicinity of the camps. They will not be allowed to run over any of the formations nor near to any of the geysers or hot springs; neither will they be allowed to run loose within 100 feet of the roads.

9. *Formations.*—No person will be allowed on any formations after sunset without a guide.

10. *Hotels.*—All tourists traveling with the authorized transportation companies, whether holding hotel coupons or paying cash, are allowed the privilege of extending their visit in the park at any of the hotels without extra charge for transportation. However, 24 hours' notice must be given to the managers of the transportation companies for reservations in other coaches.

11. *Driving on roads of park.*—(*a*) Drivers of vehicles of any description, when overtaken by other vehicles traveling at a faster rate of speed, shall, if requested to do so, turn out and give the latter free and unobstructed passageway.

(*b*) Vehicles in passing each other must give full half of the roadway. This applies to freight outfits as well as any other.

(*c*) Racing on the park roads is strictly prohibited.

(*d*) Freight, baggage, and heavy camping outfits on sidehill grades throughout the park will take the outer side of the road while being passed by passenger vehicles in either direction.

(*e*) In making a temporary halt on the road for any purpose all teams and vehicles will be pulled to one side of the road far enough to leave a free and unobstructed passageway. No stops on the road for luncheon or for camp purposes will be permitted. A team attached to a vehicle will not be left without the custody of a person competent to control it; a team detached from a vehicle will be securely tied to a tree or other fixed object before being left alone.

(*f*) In rounding sharp curves on the roads, like that in the Golden Gate Canyon, where the view ahead is completely cut off, drivers will slow down to a walk. Traveling at night is prohibited except in cases of emergency.

(*g*) Transportation companies, freight and wood contractors, and all other parties and persons using the park roads will be held liable for violation of these instructions.

(*h*) Pack trains will be required to follow trails whenever practicable. During the tourist season, when traveling on the road and vehicles carrying passengers are met, or such vehicles overtake pack trains, the pack train must move off the road not less than 100 feet and await the passage of the vehicle.

(*i*) During the tourist season pack animals, loose animals, or saddle horses, except those ridden by duly authorized persons on patrol or other public duties, are not permitted on the coach road between Gardiner and Fort Yellowstone.

(*k*) Riding at a gait faster than a slow trot on the plateaus near the hotels where tourists and other persons are accustomed to walk is prohibited.

(*l*) Mounted men on meeting a passenger team on a grade will halt on the outer side until the team passes. When approaching a passenger team from the rear, warning must be given, and no faster gait will be taken than is necessary to make the passage, and if on a grade the passage will be on the outer side. A passenger team must not be passed on a dangerous grade.

(*m*) All wagons used in hauling heavy freight over the park roads must have tires not less than 4 inches in width. This order does not apply to express freight hauled in light spring wagons with single teams.

12. *Liquors.*—All beer, wine, liquors, whisky, etc., brought into the Yellowstone National Park via Gardiner to be carried over the roads through the reservation to Cooke City, must be in sealed containers or packages, which must not be broken in transit.

13. *Miscellaneous.*—Automobiles are not permitted in the park.[1]

[1] The regulation prohibiting the use of automobiles in the park was so amended as to allow their use on the road leading from Bozeman, Mont., to the southern portion of Gallatin County, Mont., and on Aug. 1, 1915, the Secretary of the Interior admitted automobiles for pleasure purposes only, under regulations and schedules approved by him.

Persons are not allowed to bathe near any of the regularly traveled roads in the park without suitable bathing clothes.

14. *Penalty.*—The penalty for disregard of these instructions is summary ejection from the park.

Notices.—(*a*) Boat trip on Yellowstone Lake: The excursion boat on Yellowstone Lake plying between the Lake Hotel and the Thumb lunch station at the West Bay is not a part of the regular transportation of the park, and an extra charge is made by the boat company for this service.

(*b*) Side trips in park: Information relative to side trips in the park and the cost thereof can be procured from those authorized to transport passengers through or to provide for camping parties in the park; also at the office of the superintendent.

(*c*) All complaints by tourists and others as to service, etc., rendered in the reservation should be made to the superintendent in writing.

REGULATIONS OF JULY 7, 1915, GOVERNING THE ADMISSION OF AUTOMOBILES FOR THE SEASON OF 1915.

[Effective Aug. 1, 1915.]

Pursuant to authority conferred by section 2475, Revised Statutes, United States, and the act of Congress approved May 7, 1894, the following regulations governing the admission of automobiles into the Yellowstone National Park are hereby established and made public:

1. *Automobiles.*—The park is open only to such automobiles as are operated for pleasure and not to those carrying passengers who are paying, either directly or indirectly, for the use of the machine.

2. *Motor cycles.*—Motor cycles are not permitted to enter the park.

3. *Tickets of passage.*—Ticket of passage must be secured and paid for at the checking station where the automobile enters the park. This ticket must be conveniently kept, so that it can be exhibited to park guards on demand, and must be surrendered at the last checking station on leaving the park. Tickets of passage will show (*a*) name of owner, (*b*) license number of automobile, (*c*) name of State issuing license, (*d*) make of machine and manufacturer's number, (*e*) name of driver, (*f*) seating capacity of machine, and (*g*) number of passengers.

4. *Fees.*—Fees are payable in cash only, and will be as follows for each trip through the park:

For runabouts or single-seated cars	$5.00
For 5-passenger cars	7.50
For 7-passenger cars	10.00

5. *Muffler cut-outs.*—Muffler cut-outs must be closed while approaching or passing riding horses, horse-drawn vehicles, hotels, camps, or soldier stations.

6. *Distance apart—Gears and brakes.*—Automobiles while in motion must not be less than 100 yards apart, except for purpose of passing, which is only permissible on comparatively level or slight grades. All automobiles, except while shifting gears, must retain their gears constantly enmeshed. Persons desiring to enter the park in an automobile will be required to satisfy the guard issuing the ticket of passage that the machine in general, and particularly the brakes

and tires, are in first-class working order and capable of making the trip, and that there is sufficient gasoline in the tank to reach the next place where it may be obtained, and carry two extra tires. For this purpose all drivers will be required effectually to block and skid the rear wheels with either foot or hand brake, or such other brakes as may be a part of the equipment of the automobile. Gasoline can be purchased at regular supply stations as per posted notices.

7. *Speeds.*—Speeds must be limited to 12 miles per hour ascending and 10 miles per hour descending steep grades, and to 8 miles per hour when approaching sharp curves. On good roads with straight stretches, and when no team is nearer than 200 yards, the speed may be increased to 20 miles per hour. Horns must be sounded at all curves where the road can not be seen for at least 200 yards ahead, and when approaching teams or riding animals.

8. *Teams.*—When teams, saddle horses, or pack trains approach, automobiles will take the outer edge of the roadway, regardless of the direction in which they may be going, taking care that sufficient room is left on the inside for the passage of vehicles and animals. Teams have the right of way, and automobiles will be backed or otherwise handled as may be necessary so as to enable teams to pass with safety. In no case must automobiles pass animals on the road at a greater speed than 8 miles per hour.

9. *Fines.*—Fines or other penalties will be imposed for arrival of automobiles at any point before approved lapse of time, hereinafter given, at the following rates: $0.50 per minute for each of first five minutes; $1 per minute for each of the next 20 minutes; $25 fine or ejection from the park, or both, in the discretion of the acting superintendent of the park, for being more than 25 minutes early.

10. *Penalties.*—Violation of any of the foregoing rules or general regulations for government of the park will cause revocation of ticket of passage, and, in addition to the penalties hereinbefore indicated, will subject the owner of the automobile to any damage occasioned thereby, immediate ejectment from the reservation, and be cause for refusal to issue new ticket of passage to the owner without prior sanction in writing from the Secretary of the Interior.

11. *Accidents.*—When, due to breakdowns or accidents of any other nature, automobiles are unable to keep going or to reach the next stopping place on time, they must be immediately parked off the road, or where this is impossible, on the outer edge of the road, and wait until the next schedule for automobiles past that point, or until given special permission to proceed by park guards.

12. These regulations and schedules do not apply to automobiles passing over the county road in the northwest corner of the park, en route to the town of Yellowstone, Mont.

SCHEDULES AND GENERAL INSTRUCTIONS.

Automobiles may leave the park by any one of the authorized routes of entrance. Automobile drivers should compare their watches with the clocks at checking stations.

Automobiles stopping over at points other than the hotels and permanent camps will be allowed to resume travel only at such time as permits them to fall in with a subsequent regular automobile

schedule past the point of stop-over. Such automobiles while stopping over must park out of sight of, or at least 100 yards from, the main road.

Automobiles stopping over at permanent camps must leave the same at the proper time to conform with the published schedules from the nearest hotels. Detailed times of departure to comply with this provision will be posted at the particular camps concerned.

When, due to breakdowns or accidents of any other nature, automobiles are unable to keep going, or to reach the next stopping place on time, they must be immediately parked off the road, or where this is impossible, on the outer edge of the road, and wait until the next schedule for automobiles past that point, or until given special permission to proceed by park guards.

Automobiles will not be permitted for use on local trips around hot springs formations or other points of interest off the main roads, except in the case specially noted at Artist Point, in the morning schedule from the Lake Hotel to Canyon Hotel.

Speeds.—Speeds must be limited to 12 miles per hour ascending and 10 miles per hour descending steep grades, and to 8 miles per hour when approaching sharp curves. On good roads with straight stretches, and when no team is nearer than 200 yards, the speed may be increased to 20 miles per hour. No automobile shall pass another while in motion going in the same direction.

Horns.—The horn will be sounded on approaching curves, stretches of road which can not be seen for about 200 yards, and driving or riding animals; also on meeting other machines.

Teams.—When teams, saddle horses, or pack trains approach, automobiles will take the outer edge of the roadway, regardless of the direction in which they may be going, taking care that sufficient room is left on the inside for the passage of vehicles and animals. Teams have the right of way, and automobiles will be backed or otherwise handled as may be necessary so as to enable teams to pass with safety. In no case will automobiles pass animals on the road at a greater speed than 8 miles per hour.

In addition to the schedules herein given, automobiles must keep clear of any horse-drawn passenger vehicles running upon regular schedules which may be following them; and upon overtaking any horse-drawn passenger vehicles running upon regular schedules, automobiles must not attempt to pass or approach closer than within 150 yards of the same.

Reduced engine power—Gasoline, etc.—Due to the high altitude of the park roads, averaging nearly 7,650 feet for the belt line and east, north, and west entrances, the power of all automobiles is much reduced, so that about 50 per cent more gasoline will be required than for the same distance at lower altitudes. Likewise one lower gear will generally have to be used on grades than would have to be used in other places. A further effect that must be watched is the heating of the engine on long grades, which may become serious unless care is used. Gasoline can be purchased at regular supply stations as per posted notices.

	Miles.	Schedule A.		Schedule B.	
		Not earlier than—	Not later than—	Not earlier than—	Not later than—
Gardiner to Norris:					
Leave Gardiner entrance	0	6.00 a. m.	6.30 a. m.	2.30 p. m.	3.00 p. m.
Arrive Mammoth Hot Springs	5	6.30 a. m.	7.00 a. m.	3.00 p. m.	3.30 p. m.
Leave Mammoth Hotel	0	6.45 a. m.	7.15 a. m.	.....	.....
Leave 8-mile post	8	.....	8.00 a. m.	.....	.....
Arrive Norris	20	8.30 a. m.	9.00 a. m.	.....	.....
Norris to west entrance:					
Leave Norris	0	.....	.....	4.00 p. m.	4.30 p. m.
Arrive west entrance	27	.....	.....	6.00 p. m.	6.30 p. m.
(For Gallatin Station entrance see Note 1.)					
Norris to Fountain:					
Leave Norris	0	8.45 a. m.	9.15 a. m.	4.00 p. m.	4.30 p. m.
		(Via Mesa Road.)		(Via Mesa Road or Madison Junction.)	
Leave Firehole Cascades	14.7	.....	10.30 a. m.	.....	.....
Arrive Fountain Hotel	20	10.30 a. m.	11.00 a. m.	5.45 p. m.	6.15 p. m.
(For Gallatin Station entrance see Note 1.)					
West entrance to Fountain Hotel:					
Leave west entrance	0	6.45 a. m.	7.15 a. m.	.....	.....
Arrive Fountain Hotel	21	8.30 a. m.	9.00 a. m.	.....	.....
Fountain Hotel to Thumb:					
Leave Fountain Hotel	0	10.30 a. m.	11.00 a. m.	5.45 p. m.	6.15 p. m.
Arrive Upper Basin (Old Faithful Inn)	9	12.00 m.	12.30 p. m.	6.45 p. m.	7.00 p. m.
Leave Upper Basin (Old Faithful Inn)	0	2.30 p. m.	3.00 p. m.	7.00 a. m.	7.30 a. m.
Arrive Thumb Station	19	4.30 p. m.	5.00 p. m.	9.00 a. m.	9.30 a. m.
(For south entrance see Note 1.)					
Thumb to Lake Hotel:					
Leave Thumb Station	0	4.30 p. m.	5.00 p. m.	9.00 a. m.	9.30 a. m.
Arrive Lake Hotel	15	5.45 p. m.	6.15 p. m.	10.30 a. m.	11.30 a. m.
Lake Hotel to east boundary:					
Leave Lake Hotel	0	7.00 a. m.	7.30 a. m.	2.00 p. m.	2.30 p. m.
Arrive east boundary	28	9.30 a. m.	10.30 a. m.	4.30 p. m.	5.30 p. m.
East boundary to Lake Hotel:					
Leave east boundary	0	3.15 p. m.	3.45 p. m.	7.30 a. m.	8.00 a. m.
Arrive Lake Hotel	28	5.45 p. m.	6.15 p. m.	10.00 a. m.	11.00 a. m.
Lake Hotel to Canyon Hotel:					
Leave Lake Hotel	0	7.00 a. m.	7.30 a. m.	2.00 p. m.	2.30 p. m.
Leave Canyon Station	16	9.00 a. m.	10.00 a. m.	.....	.....
(See Note 2.)					
Arrive Canyon Hotel	17	9.10 a. m.	10.10 a. m.	3.15 p. m.	3.45 p. m.
Canyon to Norris:					
Leave Canyon Hotel	0	2.15 p. m.	2.30 p. m.	.....	.....
Arrive Norris	12	3.15 p. m.	3.30 p. m.	.....	.....
(For schedules from Norris to Fountain, Upper Basin, and west entrance, see p. —.					
Canyon Hotel to Tower Falls:					
Leave Canyon Hotel	0	1.30 p. m.	2.00 p. m.	7.00 a. m.	7.30 a. m.
Arrive Tower Falls:					
Via Dunraven Pass	16	3.15 p. m.	3.45 p. m.	8.45 a. m.	9.15 a. m.
Via Mount Washburn	19	4.15 p. m.	4.45 p. m.	9.45 a. m.	10.15 a. m.
(For Cooke City entrance see Note 1.)					
Tower Falls to Gardiner:					
Leave Tower Falls	0	3.15 p. m.	4.45 p. m.	9.15 a. m.	10.15 a. m.
Arrive Mammoth Hot Springs	20	5.30 p. m.	6.45 p. m.	11.15 a. m.	12.15 p. m.
Leave Mammoth Hot Springs (via main road)	0	7.00 a. m.	7.30 a. m.	2.30 p. m.	3.00 p. m.
Arrive Gardiner entrance	5	7.30 a. m.	8.00 a. m.	3.00 p. m.	3.30 p. m.
Mammoth Hot Springs to Gardiner:					
Leave Mammoth Hot Springs (via old road)	0	8.45 a. m.	9.00 a. m.	11.45 a. m.	1.00 p. m.
Arrive Gardiner entrance	5	9.30 a. m.	9.45 a. m.	12.15 p. m.	1.45 p. m.

The acting superintendent of the park has authority to change these schedules if necessary.

NOTE 1.—Owing to scarcity of travel on the roads named, automobiles will be permitted to travel without schedule on the roads between the south entrance and the thumb; between the northeast or Cooke City entrance and Tower Falls Station; and between the west entrance (Yellowstone, Montana), and the northwest or Gallatin Station entrance. Upon entering the main roads at the Thumb, Tower Falls, and the west entrance, however, automobiles must conform to the regular schedules.

NOTE 2.—Automobiles making the morning trip from the Lake to the Canyon will be permitted to make the side trip to Artist Point provided they keep within the schedule upon passing Canyon Station.

REPORT OF THE SUPERINTENDENT OF THE YOSEMITE NATIONAL PARK.

REPORT OF THE SUPERINTENDENT OF THE YOSEMITE NATIONAL PARK.

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SUPERINTENDENT,
Yosemite, Cal., October 1, 1915.

SIR: I have the honor to submit the following report of conditions and administration in the Yosemite National Park during the season of 1915:

GENERAL STATEMENT.

The Yosemite National Park, when created by the act of October 1, 1890 (26 Stat., 650), was situated in Tuolumne, Mariposa, Madera, and Mono Counties, Cal., and covered an area of about 1,512 square miles, being 36 miles wide by about 40 miles long. Under the act approved February 7, 1905, entitled "An act to exclude from the Yosemite National Park, Cal., certain lands therein described and to attach and include the said lands in the Sierra Forest Reserve," 542.88 square miles were excluded and 113.62 square miles were added to the park, making a net reduction in area of 429.26 square miles, so that the area, after the passage of the above act, was 1,082.74 square miles, the park being situated in Tuolumne, Mariposa, and Madera Counties. By act of June 11, 1906, entitled "Joint resolution accepting the recession by the State of California of the Yosemite Valley grant and the Mariposa Big Tree Grove, and including the same, together with fractional secs. 5 and 6, T. 5 S., R. 22 E., Mount Diablo meridian, Cal., within the metes and bounds of the Yosemite National Park, and changing the boundaries thereof," there were added to the park the Yosemite Valley, 48.60 square miles; Mariposa Big Tree Grove, 4 square miles; and a strip lying between the latter and the park proper, 2.13 square miles; and deducted by the change in the southwestern boundary, 13.06 square miles; making a net addition to the area of 41.67 square miles. The present area of the park is 1,124.41 square miles.

BUILDINGS.

The buildings which have been used for the housing of the Government employees this summer are the cottages that were heretofore used by the War Department, located in Camp Yosemite, the former Army post, now the Yosemite Falls Camp. These cottages are of light construction and were intended only for summer use. Two of these cottages were ceiled for use during the past winter, and if it is contemplated to use these cottages the coming winter they will have

to be ceiled before being suitable for the winter storms. The present hospital is of the same construction as these cottages and will also have to be ceiled if it is to be used this winter.

Arrangements have been made for the erection of two new buildings, to be used for fire-protection purposes, known as fire-lookout stations, or triangulation stations. One will be situated on Mount Hoffman and the other on Sentinel Dome.

During the past season there were constructed three new outpost or checking stations, which are used by the park rangers for outpost purposes, these cabins being located at Merced Grove, Crane Flat, and Hog Ranch.

The following new outpost stations for rangers' use should be built the coming year: One on the Wawona Road, somewhere in the vicinity of Camp A. E. Wood, and a somewhat larger and more spacious outpost than those constructed this year should be built at Tuolumne Meadows, at which latter place are the Lambert Soda Springs and the Sierra Club's buildings, which accommodate a large crowd each season, and in the near future it will probably be necessary for two park rangers to be stationed at this outpost—one of the first class for ranger duty and one of the second class to check automobiles, as the Tioga Road is now open and a large number of cars will be passing over that road yearly.

Other new buildings especially needed are an administration building, outpost quarters of less elaborate construction than the checking stations, and rescue lodges or chalets, as well as a new hospital.

PHYSICIAN AND HOSPITAL.

On May 1, 1915, Dr. J. S. Brooks, a physician and surgeon from San Francisco, and Dr. E. H. Coleman, a physician, opened the hospital building for the practice of medicine in the park under authority granted by the department. The building formerly used by the War Department as a hospital was slightly remodeled, providing a new operating room. These physicians were allowed to sell drugs. The hospital was rendered more serviceable and better equipped to handle cases of sickness as well as operative cases. The physicians in charge were aided by a trained nurse. This arrangement, although not entirely satisfactory from point of equipment and necessities for handling the cases, was a great improvement over past years, and was a great help in the handling of cases of accident and sickness occurring this season. Had it not been for the establishment of this hospital and the presence of these physicians, probably there would have been two deaths from sickness; one, a case of appendicitis wherein the patient was treated and recovered, and another, a serious case of pneumonia which was handled in an excellent manner. There was one major operation performed and many minor operations. During the past winter the Yosemite Valley was without a physician, which should never be allowed to occur in the future. It is urged that the department provide this park at all times with a physician, a hospital, and hospital equipment throughout the year. At present this hospital is equipped with an inadequate X-ray apparatus which is not powerful enough to be used on the larger portions of the body, and at one time this season when an

X-ray apparatus was much needed it was very disappointing as well as serious to find that the one in the hospital belonging to the physicians was not powerful enough for the use required of it. It is therefore urged that this hospital be equipped with a larger X-ray apparatus and other necessities so that major operations may be performed without any serious results occurring from the lack of proper equipment.

ACCIDENTS AND DEATHS.

On going over the reports of the past few years and perusing what data is available in this office, it is noticed that this is the first year since 1908 in which there has not been a death occurring in the Yosemite National Park or an accident of a serious nature. The absence of a death due to sickness is largely due to the establishment of the new hospital and its excellent service. The lack of accidents this year, in which the visitors have been more than double that of any year in the past, is largely due to the instructions given to people concerning trails, the particular pains taken in reference to instructions as to the operation of automobiles on the narrow roads, and the strict attention given to the upkeep of the same, and to the speed or fast driving of the many automobile transportation stages carrying passengers to the valley. The most serious accident during the year occurred on the Wawona Road, a short distance above Artist Point, when one of the seven-passenger transportation stages in shifting gears backed down a grade onto a large rock at the side of the road and the car was partially overturned, throwing its occupants to the ground. The passengers were immediately taken to the hospital and were rapidly recovering when taken from the hospital to their homes. Other minor accidents occurred on the trails at different times during the season when tourists were injured, some by trying to do the impossible in mountain climbing, and others in smaller ways by sprained ankles, etc. These cases were always taken care of by the ranger department and the persons injured brought to the hospital, where they were cared for.

There were but few accidents among the employees, one occurring to Marcus Shinskie, a painter, October 29, 1914, who had his fingers badly bruised. One other employee, Tom Lupton, an Indian, employed at the sawmill operating the wood splitter, had his hand badly crushed, which resulted in the amputation of two fingers, which operation was performed in the Yosemite Valley Hospital.

SANITATION.

The sanitation of the Yosemite Valley is cared for by primitive methods which are defective. As a protection to the health of the people in the Yosemite Valley the present methods are probably taking care of the situation as well as can be expected, but as a protection to the health of the people of the San Joaquin Valley, dependent on the Merced River as a water supply, steps should be taken at once to design and install a complete sewerage system and disposal plant in the nature of septic tanks, to be placed in proper places in the Yosemite Valley. In doing this it would also make it much more

convenient and a greater protection to the health of the people of the Yosemite Valley in that they would be able to make use of the river water in any section of Yosemite Valley for drinking purposes, where at present the water can only be used in such sections of the river as lie above the present village site, as the sewage from the present camps and village drains into the river at these points. The garbage is disposed of in a very up-to-date method, being gathered daily in garbage wagons, hauled to a pit, and buried.

ELECTRIC LIGHT AND POWER.

There has been a marked increase in the use of electricity for power and lighting purposes within the park the past year, owing to the installation of the Yosemite Falls Camp and the additional street lights installed, and the time is near when the present plant will not be able to supply the demand. This increase in the use of current for power means an increase in the park revenue, and the sale of the same to concessioners should be encouraged. The time is not far distant when the cutting of wood under the present forestry thinning and clearing system must cease on the floor of the valley, and at such time a new fuel must be provided and new heating and cooking devices installed in the various camps and places of business. This fuel will either have to be brought into the valley from the outlying districts in the nature of wood, coal, or oil, any one of which would be no source of revenue to the park, since it would be an article brought from outside of the park. It would therefore be good business policy if the Government would during the coming year build an electric light and power plant large enough to provide current for all heating, cooking, and lighting for the concessioners and Government buildings within the park, fixing such a rate for such current as would compete successfully with the fuel shipped in from outside of the park, and at the same time having the concessioners install electric cooking devices of the type that has been so successfully in use by the United States Navy in the past. I believe that by this method the park, without any increased expense for operation, could greatly increase its revenues without any extra financial burden being placed on the concessioners and residents of the valley, giving them a more convenient and modern service, and at the same time conserving the forests in the park and only allowing the necessary trees to be cut as in the judgment of some forestry man are necessary. These trees would always furnish enough wood for the campers and places that are not equipped with electricity, also enough wood for fireplaces for added appearances to lounging rooms.

WATER SUPPLY.

During the past five years work has been done on the water-supply system of the Yosemite Valley as funds were available, until the work is now nearing completion. All the principal points, except Kenneyville, are now provided with water from the water mains of sufficient capacity to afford fire protection. In the future such extensions as are necessary can be made from the present system as

needed to meet any requirements. Some small mains will have to be run to some of the camp sites, which may be taken care of when necessity requires.

TELEPHONE LINES.

The work of maintaining the telephone system between the outposts, and also the service to the concessioners on the floor of the valley, has been under the direction of J. W. Emmert, chief electrician. The lines heretofore constructed have been of a light wire, which is very expensive to maintain in the summer season owing to the fact that the wire is strung from tree to tree in many places and small limbs falling from these trees break the light wire in many places. Also the heavy winter snow each season breaks and throws down these lines so that they have to be practically rebuilt at the opening of each season. It is, both from a financial standpoint and that of good service, advisable that in the future all of these lines be constructed of wire not lighter than No. 9 and substantially put up. The present switchboard of the Yosemite Valley has been enlarged from time to time and is now carrying its full capacity. We have on it about 50 drops, or 50 lines, and with a view of increasing business and better service, I believe that this office equipment should be enlarged four times its present capacity so that some of the present lines may be divided, with a view to better service.

ROADS.

There are only a few miles of macadamized roads under the control of the Government, most all of them being earth roads. This makes the cost of road maintenance very expensive—as these earth roads are hard to keep in shape—and reduces the quantity of material hauled, which makes the cost of freight much higher than if the roads were of equal, regular grade. The macadamized roads within the park consist of one-half mile of oil-bound, put in for experimental purpose, and 2.16 miles of water-bound macadam. All the roads in the park at the present time are in about as good condition as they have been in past years, being of a very poor standard, owing to the heavy cost of maintenance and the amount of money available to be expended on the many miles of road running through this park. A large sum of money is spent yearly for the purpose of sprinkling, which, if better roads were built, could be greatly reduced. If the present road between El Portal and the Pohono Bridge is to be used in the future it should be oiled, not from a standpoint of making it a hard-surfaced road but with a view of settling the dust and putting the road in a condition so that the large expense of sprinkling this 9 miles of road may be eliminated. This road is of granite material, and, by the use of heavy automobile trucks, grinds into a very fine dust, which rises and stays in the air for a long time. Proper oiling would hold this dust so that it would not rise, and at the same time be a large financial saving to the Government yearly. If the type of road that is now on the floor of the valley is to be used next year, we should install power-driven sprinkling machines to replace the inadequate sprinkling wagons drawn by horses, it

being possible to haul at least five times as much water at twice the speed of the present horse-drawn vehicles and to give greater efficiency, for the power-propelled equipment could be used night as well as day. I believe that by the use of one power-driven sprinkler we could replace and do the same work that is at the present time carried on by five of the four-horse sprinklers, this being mainly of financial interest to the park, at the same time giving better service.

The Yosemite National Park is greatly in need of better roads. All the State roads connecting with the park are being macadamized and are of a much higher quality and much better kept than the roads within the park, and it becomes a point of continuous criticism from the visitors to the national park. It is, therefore, especially urged that an appropriation, available until expended, be made for the construction of first-class highways throughout the park, and the necessary steps should be taken, where the maps have not already been made, to relocate these roads on proper grades so that this work may be carried on at once. From a financial standpoint the building of new roads would in many ways be of great saving to the Government in the future from maintenance and repair standpoint and from that of sprinkling. These roads are of such a type that it is necessary for large expenditures of money to be made on them after the winter snows and spring rains so that they may be put into condition to be passable, and after the rainy season has ceased the large expense of sprinkling is added to the road cost; this would be greatly eliminated if the proper type of roads were constructed, making it possible to save for the Government the cost of construction of these roads in years to come by relieving the high cost of maintenance and repairs which will continue yearly under the present system.

RANGERS.

The ranger department was reorganized under the new park system installed this year, the park rangers being divided into two classes, known as park rangers of the first class (mounted) and park rangers of the second class (unmounted) or automobile checkers. The park-ranger force consists of a chief park ranger, Mr. O. R. Prien, two assistant chief park rangers, and two park rangers, all permanent employees, and seven temporary park rangers, all of the first class, together with four rangers of the second class or automobile checkers. With this ranger department the Government has been able to handle the checking of the automobiles, as well as the protection of the park against forest fires and poachers, with the enforcement of the park rules and regulations. This park-ranger force has very capably taken care of the work performed in previous years by troops of Cavalry detailed from the United States Army and stationed in this park.

It is recommended that this park-ranger force be increased by at least two permanent yearly men, one to take charge of the insect-control work, which should be carried on each season and which has been under the direction of Mr. J. J. Sullivan, entomological ranger detailed for duty in this park from the Bureau of Entomology, Department of Agriculture, and the other to take charge of the newly established information bureau.

FOREST FIRES.

This season the forest fires did very little damage and were easily controlled by the park rangers, assisted by the other park employees.

Arrangements have been made and materials purchased for the construction of two fire-lookout stations or triangulation stations for the use of the ranger department for fire protection. Owing to the location of these stations, one being on Mount Hoffman and the other on Sentinel Dome, it will be possible with the high-power instruments at hand for the ranger department to instantly locate a fire or fires within the district and by the triangulation system be able to give the exact location of the fire immediately the fire starts. It is absolutely necessary that these two stations cooperate with the triangulation stations of the Forest Service where possible in the surrounding districts and that we have telephonic communication, so that we may work together in locating forest fires, for the protection of the park as well as the national forests surrounding the park. It would be well when funds are available to establish one or more of these triangulation stations in other districts of the park, as it will not be possible for these two stations to control the whole park area. These stations will lessen the expense of fire protection as well as afford a great protection to the forests of the park.

LAMBERT SODA SPRINGS.

The Lambert Soda Springs at the Tuolumne Meadows, on the Tuolumne River, about 25 miles by trail from Yosemite Valley, have been of considerable interest to the visitors to the Yosemite National Park this year, owing to the fact that it has been the first time in the history of these springs that it has been practicable for tourists to make trips to this part and have fine service, such as was given them by the Sierra Club in connection with its camp located near the Soda Springs. There were registered at this camp this season 2,236 visitors. This was partially due to the Tioga Road, which has recently been opened and affords the tourist a convenient way of reaching that point by automobile. The Lambert Soda Springs have this year for the first time received any large extent of recognition, and it would be well for the Government to take the necessary steps to advertise these springs.

The following is an excerpt from the report of Mr. Gerald A. Waring, found on page 237 of Water-Supply Paper 338, of pamphlet entitled "Springs of California," edition of 1915, prepared by the United States Geological Survey:

The springs rise at the northern edge of Tuolumne Meadows, about 125 yards north of the river's edge, at the upper border of a grassy slope. There is only one spring of appreciable flow, but water bubbles from numerous vents near by. The spring rises in a funnel-shaped pool about 14 inches in diameter in a little log cabin that protects it. In August, 1909, it yielded about 1 gallon a minute, but its discharge is said to vary somewhat. The water is clear, strongly carbonated, and effervescing, but considerable iron is deposited in the pool. Within the cabin are also two small vents of inappreciable discharge marked by bubbling. Six other similar pools, a few inches in diameter, lie on a low mound of iron-stained lime carbonate beside the cabin, and another group of eight small pools is located 15 to 25 yards northeast of the cabin. The water in all of the

pools is carbonated and small amounts of iron and lime carbonate are deposited at nearly all of them. Efflorescent soda salts also appear in the adjoining grassy land. The following analysis shows the water to be primary and secondary alkaline in character:

Analysis of the Lambert Soda Springs.

[Analyst and authority, F. M. Eaton (1909). Constituents are in parts per million.]

Temperature	8° C. (47° F.)
Properties of reaction:	
Primary salinity	11
Secondary salinity	0
Tertiary salinity	0
Primary alkalinity	36
Secondary alkalinity	53
Tertiary alkalinity	7

Constituents:	By weight.	Reacting values.
Sodium (Na)	229	9.96
Potassium (K)	5.3	.14
Calcium (Ca)	196	9.81
Magnesium (Mg)	20	1.64
Iron (Fe) / Aluminum (Al)	6.2	.22
Sulphate (SO_4)	24	.49
Chloride (Cl)	66	1.87
Carbonate (CO_3)	564	18.80
Silica (SiO_2)	58	1.98
	1,168.5	———
Carbon dioxide (CO_2)	Present.	Present.

INSECT CONTROL.

The work of falling and burning insect-infested trees with the object of eradicating injurious insects and protecting the remaining trees from other attacks has been continued this year under the direction of Mr. J. J. Sullivan, entomological ranger, detailed from the Bureau of Entomology, Department of Agriculture. Work has been done on the floor of the valley and in the district between the Pohono Bridge and Fort Monroe, between Cascade Creek and Ribbon Falls, in the vicinities of Mount Starr King, Clarks Fork, and Cascade Basin. It will be possible to complete this insect-control work the coming year to a point where it will be possible for one man in the future to take care of the infested trees, which will be only scattered throughout the park, if a sufficient amount of work is done the coming season. There are several districts which should be thoroughly treated, which can be done for a reasonable sum of money, which will appear later in the report of Mr. Sullivan. The work to date has been so effective that this office recommends that it be carried to completion next year.

MUSEUM.

This year this office has taken the necessary steps, both from an educational standpoint as well as a standpoint of interest not only to tourists but to the ranger department and park employees, to provide for a collection of the different varieties of animals, birds, insects, woods, flowers, and other specimens, to be placed in a room set aside for this purpose in the Government building. This work requires considerable time and study and it is recommended that the same be

carried on next year and that the necessary funds be allotted to carry this work to completion.

MIRROR LAKE.

I wish to emphasize the recommendations of my predecessors in regard to the removal of the deposits of sand from Mirror Lake. This lake has been one of the wonders of this playground, giving a reflection of the mountain scenery of unusual beauty, and its reputation has gone far and wide. Tenaya Creek, which passes through the lake, has carried down from the mountain and deposited in the lake such a quantity of sand that the size of the lake has been reduced to a mere pond, almost disappearing during low water. There is also growing around and in the lake large numbers of willows, which have almost prevented the view of the tourist at even the high-water periods, when the lake is at its best. Funds should be provided for the dredging out of this sand and also the removal of these willows.

BIG TREES.

The Merced and Tuolumne Groves of Big Trees have this year for the first time entertained visitors in large numbers, there being 4,219 people visiting the groves this season. This was due to the advertising of the groves by the transportation company which built a new section of road, making it possible for automobiles to run by a much shorter and better graded road between El Portal and the Yosemite Valley by way of the Merced and Tuolumne Groves. The route traversed between El Portal and the Big Trees is very scenic, containing many beautiful views on the journey.

The Mariposa Grove, which, of course, is much larger than the two groves above mentioned, has entertained 13,974 visitors this season.

Since the operation of automobiles into these groves of big trees in such large numbers by both the transportation companies and private individuals the roads have been in a very poor condition, and during the coming season the necessary steps should be taken to repair and widen them so that they will be more accessible to automobile travel.

There should also be some clearing of underbrush and fallen timber, so that the groves may be made more sightly and better protected against forest fires during the ensuing year.

PATENTED LANDS.

Attention is invited to the recommendations of my predecessors to the effect that the title to all patented lands within the park be extinguished. I am in hearty accord with these recommendations. A summer resort and town, known as Foresta, has been maintained on patented lands within the park during the last three seasons. A tract of patented land on the Big Oak Flat Road at a place known as Gentrys has been subdivided into lots, with the purpose of establishing a town and summer resort. It is rumored that other owners of patented lands contemplate the establishment of camps for the accommodation of tourists, thereby having all the advantages afforded

by the Government's administration, without paying anything toward the maintenance of the park, as is required of all concessioners on the public lands.

Under act of Congress of April 9, 1912, the Secretary of the Interior and the Secretary of Agriculture, for the purpose of eliminating private holdings within the Yosemite National Park and to prevent cutting and keep intact the timber along and adjoining the road and scenic portions of the park on patented lands, exchanged certain timberlands within the Yosemite National Park and the Sierra and Stanislaus National Forests for other lands belonging to the Yosemite Lumber Co. which were within this park and lying along the scenic Wawona Road. This exchange prevented the Yosemite Lumber Co. from cutting such timber as would destroy the scenic beauty of this road.

INFORMATION BUREAU.

A bureau of information was established at the superintendent's office, in Yosemite Village, May 15, 1915, in charge of Mr. T. H. Moore, for the purpose of keeping the tourists informed as to all points of scenic interest in the park; the heights, distances, trails, road and camp conditions; mapping out trips; assigning visitors to the various public camps; inaugurating a mailing list for the department's literature on the national parks; handling all correspondence relative to inquiries for camps, camping, guides and stock, rates, etc.; and everything that would facilitate and add to the pleasure of the tourists. Also a bureau for lost and found articles was established and the public invited to report all articles lost and found in the park. It was the custom to post notices in conspicuous places of lost and found articles, and in this way many articles were returned to the owners. The money value of articles returned to proper owners during the season was $780.

This bureau also had charge of the collection of automobile fees under the accounting division, and issued the permits authorizing the entrance of automobiles over any of the roads of the park, the Tioga, Wawona, Coulterville, and Big Oak Flat Roads. Also the tickets of passage for all outbound cars were issued from this office. A report was made daily, showing the number of visitors staying at each hotel, camp, and public camp ground. Reports were also made of the arrival and leaving time of the automobile stage companies operating to the Mariposa Grove of Big Trees and also to the Tuolumne Grove. Other statistical reports on travel to the park and transportation, etc., have been kept.

AUTOMOBILES.

The total number of automobiles entering the park during the period October 1, 1914, the date of last annual report, and September 30, 1915, was 2,270. The automobiles came in via the following park entrances:

Via Coulterville Road	476
Via Big Oak Flat Road	654
Via Wawona Road	950
Via Tioga Road	190
Total	2,270

Number of people visiting park in private cars season of 1914	7,166
Automobiles admitted to the park from Sept. 1, 1913, to Sept. 30, 1914, the date of last annual report	739
Number of people visiting park in private cars season of 1915	20,814
Automobiles visiting Glacier Point prior to taking off fee of $5 on June 27, 1915	10
Automobiles visiting Glacier Point after extra $5 fee was taken off on June 27, 1915	417
Number of people visiting Glacier Point in private cars	1,520
Automobiles camping in public automobile camp	881
Number of people camping in public automobile camp	3,890
Automobiles camping in public automobile camp, Sept. 1, 1913, to Sept. 30, 1914, the date of last annual report	369
Number of people camping in public automobile camp ground season of 1914	1,107
Average number of people in each private automobile entering the park during the season of 1915	3¼

Records show 39 per cent of the automobiles entering the park during the 1915 season camped in the public automobile camp ground.

Private automobiles passing through the Tuolumne Grove of Big Trees	1,219
Number of people visiting the Tuolumne Grove of Big Trees	8,180
Private automobiles passing through the Merced Grove of Big Trees	470
Number of people visiting the Merced Grove of Big Trees	2,527
Private automobiles passing through the Mariposa Grove of Big Trees	1,440
Number of people visiting the Mariposa Grove of Big Trees	13,974

Automobiles entering the park during the season of 1915 came from the following points in the United States and foreign countries:

RESIDENCE OF AUTOMOBILE VISITORS.

Arizona	34	Ohio	29
Arkansas	1	Oklahoma	16
California	1,813	Oregon	48
Colorado	12	Pennsylvania	9
Connecticut	5	Philippine Islands	14
District of Columbia	4	Rhode Island	2
Delaware	1	South Carolina	4
Florida	2	South Dakota	3
Georgia	1	Tennessee	14
Hawaii	1	Texas	9
Idaho	4	Utah	2
Illinois	27	Vermont	1
Indiana	11	Virginia	1
Iowa	9	Washington	32
Kansas	12	West Virginia	4
Kentucky	1	Wisconsin	6
Louisiana	3	Wyoming	2
Maine	2	Total	2,261
Massachusetts	13		
Michigan	9		
Minnesota	1		
Missouri	15		
Montana	5		
Nebraska	8		
New Hampshire	1		
New Jersey	4		
New Mexico	4		
New York	31		
Nevada	29		
North Dakota	1		

FOREIGN COUNTRIES.

Australia	1
British Columbia	1
China	2
Mexico	5
Total	9

Total number from United States	2,261
Total number from foreign countries	9
Grand total	2,270

AUTOMOBILE SERVICE ON FLOOR OF VALLEY.

Rent automobile service was installed on the floor of Yosemite Valley on July 16, 1915, at a low rate of hire, to carry tourists from camp to camp and to points of interest, also to make special trips over the Tioga Road, which enabled visitors to see the high Sierras with ease and comfort.

This service made it possible for tourists to visit all points of interest on the floor of the valley without fatigue, as many visitors are unable to make trips by wagon or on horseback, on account of their physical condition. This service has also partially reconciled the automobile tourist, who is not allowed to use his automobile for motoring on the floor of the valley.

The drivers of these rent cars are efficient men who are familiar with all roads, turnouts, sharp turns, etc., and with the locations where horse and foot trails lead into the main roads, the arrival and departing time of all stages, etc., on the floor of the valley. Tourists in private automobiles are not allowed to use them for motoring on the floor of the valley, save as a means of ingress and egress, as the average tourist is not familiar with turnouts, sharp turns, the places where trails lead into the roads, the arriving and departing time of stages, etc., and would be almost constantly meeting other traffic at unexpected places, and the likelihood of accident would be thus greatly increased. Furthermore, the roads in their present condition are too narrow to handle all the traffic that would result if private automobiles were allowed to run about as they pleased, in addition to the regular transportation companies, and there would undoubtedly be many serious accidents each season. For this reason the roads should be widened and improved as soon as possible.

AUTOMOBILES ON THE TIOGA ROAD.

The Tioga Road was opened for travel on July 28, 1915. This enables visitors in private automobiles to drive 260 miles through the park on a fee of $5, ascending to an altitude of approximately 10,000 feet above sea level. The view of mountain scenery at this height can not be surpassed. The Lambert Soda Springs are located in the Tuolumne Meadows, in the eastern part of the park, near the permanent camp of the Sierra Club, who had 2,236 visitors registered during the past season. Before the opening of the Tioga Road, visitors to the Lambert Soda Springs were obliged to travel on horseback over the mountain trails. About 350 automobiles have passed over this new park highway since its opening.

VISITORS.

Visitors to the park during the period October 1, 1914, to September 30, 1915, were distributed as follows:

Sentinel hotel	8,323
Camp Curry	11,250
Camp Lost Arrow	2,611
Camp Ahwahnee	1,426
Camp Yosemite Falls	2,851
Public automobile camp	3,890
Public transient camps	1,291
Total	31,642

Visitors entered the park by the following means of transportation:

Yosemite Transportation Co., from El Portal	19,078
Wawona Stage & Turnpike Co., from Wawona	2,538
Big Tree Auto Stage Co. (A. B. Davis), operating from El Portal to Yosemite via the Merced and Tuolumne Groves of Big Trees	2,213
Private automobiles	7,166
By wagon, horseback, and walking	647
Total	31,642
Number of tourists registered at Soda Springs and Tuolumne Meadows	2,236
Number of tourists registered at Glacier Point hotel	4,369

RESIDENCE OF VISITORS.

United States:	
Alaska	2
Alabama	46
Arizona	95
Arkansas	43
California	12,162
Colorado	172
Connecticut	400
District of Columbia	384
Delaware	44
Florida	60
Georgia	125
Hawaii	86
Idaho	29
Illinois	1,765
Indiana	391
Iowa	318
Kansas	226
Kentucky	174
Louisiana	112
Maine	155
Maryland	108
Massachusetts	1,447
Michigan	378
Minnesota	88
Missouri	594
Mississippi	43
Montana	43
Nebraska	171
New Hampshire	86
New Jersey	934
New Mexico	35
New York	4,207
Nevada	75
North Carolina	66
North Dakota	36
Ohio	1,028
Oklahoma	68
Oregon	600
Pennsylvania	1,948
Philippine Islands	9
Rhode Island	117
Porto Rico	2
South Carolina	66
South Dakota	29
Tennessee	100
Texas	357
Utah	44
Vermont	31
United States—Continued.	
Virginia	187
Washington	201
West Virginia	114
Wisconsin	304
Wyoming	50
Unknown	946
Total	31,301
Foreign countries:	
Australia	43
Austria	2
Cuba	4
Canada	30
Chili	14
China	13
England	36
France	20
Germany	8
Holland	8
Italy	8
Ireland	1
Java	1
Japan	30
Mexico	7
New Zealand	8
Panama	7
Russia	2
Servia	15
Scotland	2
South Africa	2
Siam	6
Switzerland	1
Tahiti	1
Tasmania	2
Sweden	3
Denmark	2
West Indies	3
Sumatra	2
Venezuela	4
Guatemala	5
Uruguay	5
Spain	6
Total	301
Grand total	31,602

shall be kept in a separate fund by the United States, to be applied to the building and maintenance of roads and trails and other improvements in Yosemite National Park and other national parks in the State of California. The Secretary of the Interior shall designate the uses to be made of sums paid under the provisions of this section, under the conditions specified herein.

Section 4 of the act provides that no timber shall be taken, cut, or destroyed within Yosemite Park or Stanislaus Forest, except as such may be actually necessary to construct, repair, and operate its reservoirs, dams, power plants, water power, and electric works, and other structures mentioned in the act, but that no timber shall be cut or removed from lands outside of the right of way until designated by Secretary of Interior or Secretary of Agriculture, and the grantee shall pay the full value of all timber and wood cut, injured, or destroyed on or adjacent to any of the rights of way and lands, as required by either of said officers: *Provided*, That no timber shall be cut by the grantee in Yosemite Park except from land to be submerged or which constitutes an actual obstruction to the right or rights of way or to any road or trail provided for in the act.

EXTENSION OF THE PARK BOUNDARIES.

Under the act approved February 7, 1905, entitled "An act to exclude from the Yosemite National Park, Cal., certain lands therein described and to attach and include the said lands in the Sierra Forest Reserve," 542.88 square miles were excluded, certain parts of which lie on the eastern boundary of the present park and which contain many scenic views, such as the Devils Post Pile, lakes, high mountains, glaciers, canyons, which are in the judgment of many not equaled by any of the views that are within the present park boundaries. Such beautiful lakes as Thousand Island Lakes, Garnet Lake, and the Minaret, with the glaciers leading into it, and the floating glaciers in the lakes are remarkable. These lakes lie at the foot of Mount Ritter and Mount Banner, which are of great beauty, and also Mount Ritter is of higher altitude than any of the mountains within the boundaries of the present park and gives a very commanding and impressive view. This section compares very favorably with the Canadian Rockies and would make a beautiful trip of scenic value in connection with the people visiting the Tuolumne Meadows and the Lambert Soda Springs by automobiles traveling over the Tioga Road.

I therefore would recommend to the Government that the necessary steps be taken to have put back into the park boundaries all the land excluded by this act lying on the eastern boundary of the park and also taking in township 1 north, range 25 east, which will include the wonderful set of Saddlebag Lakes and also the Leevining Canyon, which is traversed by the Tioga Road after leaving the park boundaries in its route to Mono Lake and which is of so much value to the park at the present time that people travel from Yosemite Valley, a distance of 80 miles through the park land and out of its boundary on the east side, for the one purpose of seeing Leevining Creek Canyon, which is in the opinion of many people not equaled by the Grand Canyon for its impressiveness as to depth, ruggedness, and other scenic beauties. Its head is continuously capped with snow, large

Lease, special use, and water-power permits under act of Feb. 7, 1905, etc.—Con.

Period of concession.	Name of concessioner and privilege granted.	Compensation exacted.
ndeter-minate period.	City and County of San Francisco, Cal. (transferees of Sierra Ditch & Water Co.) Right of way for reservoir site (known as Cherry Valley Reservoir site), comprising 630 acres of land in the Stanislaus National Forest, under lease granted July 30, 1908, to Sierra Ditch & Water Co. All timber cut to be paid for at stipulated rates from $1.50 to $5 per thousand feet, according to kind of timber cut.	[1] $945
Do.....	Yosemite Lumber Co. Special-use permit, approved by district forester, Forest Service, June 27, 1911, for right to construct logging railroad and inclined tramway in Sierra National Forest, for removal of timber adjacent to company's road. All timber used to be paid for at rate to be fixed by forest supervisor, Sierra National Forest, which shall correspond with prevailing stumpage rates charged on said national forest when timber is cut. Stipulations signed by company June 20, 1911, and approved June 27, 1911, by District Forester F. E. Olmstead, accompanying the permit, require annual payment (outside of charge for live and dead timber, standing and down, cut, damaged, killed, or destroyed along right of way, title to which at time of cutting is in United States) of $1,200 on demand therefor being made by the Secretary of the Interior.	[1] 1,200 ([2])
Do.....	Yosemite Lumber Co. Special-use permit, approved Nov. 22, 1911, by E. G. Dudley, acting forest supervisor, Sierra National Forest (Forest Service), authorizes construction and operation of telephone line along inclined tramway and logging railroad in Sierra National Forest.	[3] 5
Do.....	Yosemite Lumber Co. Special-use permit, approved Nov. 22, 1911, by E. G. Dudley, acting forest supervisor, Sierra National Forest (Forest Service), covers right of way for, and authorizes construction and operation of, pipe line about one-half mile long from spring on lands segregated from park (in Sierra National Forest) for purpose of piping water from company's inclined tramway and logging railroad to supply boilers of steam-hoisting plant, etc.	[3] 10
50 years [4].....	Merced River Electric Co. (project "A"), final water-power permit granted by Agriculture Department (Forest Service) Apr. 11, 1911, running for 50 years, unless sooner revoked by that department, for right of way for diverting dam and power conduit in Stanislaus National Forest. Annual charge over lands segregated from park based on 1,460 horsepower, at 10 cents per horsepower for first year, with increase of 10 cents per horsepower each succeeding year until maximum charge of $1 per horsepower is reached, annual charge thereafter being at latter rate. Stipulations signed by officers of company Mar. 21, 1911 (and accompanying above permit), provided that payment upon above basis should be made annually in advance from Jan. 1, 1912, permit, however, being approved Apr. 11, 1911, and first payment, $146, being made June 7, 1911; this payment was applied on 1911 calendar year. Amount due for fourth year, 1914, 1,460 horsepower, at 40 cents; horsepower capacity subject to readjustment after expiration tenth year.	584

[1] Per annum, on demand of Secretary of Interior.
[2] Value of all timber cut and paid for on right of way (payment of $406.56 made May 3, 1912, and $334.56 made Oct. 3, 1912), $741.12.
[3] Per annum, in advance.
[4] Unless sooner revoked by Department of Agriculture.

EXCERPT FROM ACT OF CONGRESS APPROVED DECEMBER 19, 1913, GRANTING TO THE CITY AND COUNTY OF SAN FRANCISCO CERTAIN RIGHTS OF WAY IN, OVER, AND THROUGH CERTAIN PUBLIC LANDS IN THE YOSEMITE NATIONAL PARK AND STANISLAUS NATIONAL FOREST ADJACENT THERETO.

Section 7 of the above act provides that for and in consideration of the grant by the United States as provided for in this act, the said grantee shall assign free of cost to the United States all roads and trails built under the provisions hereof; and further, after the expiration of 5 years from the passage of this act the grantee shall pay to the United States the sum of $15,000 annually, for a period of 10 years, beginning with the expiration of the 5-year period before mentioned, and for the next 10 years following $20,000 annually, and for the remainder of the term of the grant shall, unless in the discretion of Congress the annual charge shall be increased or diminished, pay the sum of $30,000 annually, said sums to be paid on the 1st day of July of each year. Until otherwise provided by Congress, said sums

wood, 16 to 20 head; Repair of roads, trails, freight nauling, fighting fires, etc., 30 to 40 head. The balance of the stock is used in administration, construction, repair, and improvement work in the park, as required.

No payment is made to the contractor for stock that is used during the winter months nor for stock that is not steadily and regularly employed.

Very respectfully,

GABRIEL SOVULEWSKI,
Park Supervisor.

REPORT OF THE RESIDENT ENGINEER.

YOSEMITE, CAL., *September 30, 1915.*

Mr. GEO. V. BELL,
Superintendent Yosemite National Park,
Yosemite, Cal.

SIR: I have the honor to submit the following report of work done under my direction during the period from September 1, 1914, to August 31, 1915:

ROAD WORK.

The labor costs of maintenance and slight improvements of existing roads during this period has been $9,307.65, divided among the various roads as follows:

Roads on floor of Yosemite Valley	$3,723.59
El Portal Road, from park boundary to Pohono Bridge	3,439.54
Wawona Road, from floor of valley to Fort Monroe	378.50
Big Oak Flat Road, from floor of valley to Gentrys	266.00
Roads in the Mariposa Big Tree Grove	710.50
Road to Mirror Lake	218.06
Big Oak Flat Road, from Gentrys to park boundary	471.46
Total	9,307.65

Floor of Yosemite Valley.—This work consisted of the general upkeep of roads on the floor of the valley and resurfacing with river gravel of 1½ miles of road. Most of the work was done on the road traveled by automobiles, commencing at the Pohono Bridge, thence via Camp Ahwahnee, Yosemite Village, Camp Curry, Kenneyville, and to the garage, a distance of approximately 7½ miles. This cost is rather heavy, due to the resurfacing of the 1½ miles with gravel.

El Portal Road, from park boundary to Pohono Bridge.—Over this road is carried all freight and passengers entering or leaving the valley by way of El Portal and the Yosemite Valley Railroad. It follows the Merced Canyon, and is an expensive road to maintain. It is about 7.75 miles in length and the cost of maintenance is $443 per mile per year.

Wawona Road.—This is a part of the road from Yosemite Valley to the Mariposa Big Trees that is owned by the Government. It is about 3¼ miles in length, and leads from the floor of the valley up the side of the canyon. Cost of maintenance is $116 per mile per year.

Big Oak Flat Road, from floor of valley to Gentrys.—This section of road, 4.1 miles in length, is that portion of the Big Oak Flat Road owned by the Government reaching from the floor of the valley up the side of the canyon to Gentrys. The cost of maintenance is $62 per mile per year.

Mariposa Big Tree Grove.—These roads are about 8 miles in length and the cost of maintenance is $88 per mile.

Big Oak Flat Road from Gentrys to the park boundary.—This road until the present season has been a toll road. It forms a part of the route from El Portal to Yosemite Valley via the Tuolumne Big Trees. It is also the road most used by automobiles in entering the park. It is about 10 miles in length, and the cost of maintenance was $47 per mile.

Mirror Lake Road.—This road is a spur leading to Mirror Lake to which it was desired to admit automobiles, but before this could be done it was considered advisable to widen the same and provide additional turnouts, which was done at a labor cost of $218.

Summary.—The work of maintaining the park roads this season has been more costly than usual, due to the unusual rains in the month of May and the heavy automobile traffic. Practically all these roads are ordinary earth roads, requiring constant attention to keep them in a passable condition for automobiles.

It is especially urged that an appropriation, available until expended, be made for the construction of first-class bituminous highways throughout the floor of the valley, from El Portal to the Pohono Bridge, from the floor of the valley to Wawona, from Chinquapin to Glacier Point, from the floor of the valley to where the Big Oak Flat Road intersects the park boundary, and in the Mariposa Big Trees. These are the main traveled routes. They should be relocated on easy grades.

BUILDINGS AND STRUCTURES.

BUILDINGS.

The following new buildings have been constructed:

Ranger cabins.—Three new ranger cabins, one at the Merced Grove of Big Trees, one at Crane Flat, and one at Hog Ranch, have been built. They are log cabins with shake roofs, 32 feet 3 inches by 25 feet in plan, having four rooms. The cost of each is as follows: Labor, $655.36; materials, $150.98. Total, $806.34.

Ranger stables.—At each of the three above ranger cabins shed stables were built for the accommodation of the horses of the rangers. They are 12 by 20 feet in plan and are built of native poles and shakes. Their cost is as follows: Labor, $51.33.

Woodshed.—One woodshed, size 12 by 14, of shakes has been built for the use of the occupants of one of the buildings formerly used as an officers' quarters in the old Army post. The cost is as follows: Labor, $23.74; materials, $21.55. Total, $45.29.

Hitching shed.—A shed 16 by 24 feet, of native posts and shakes, has been built in the rear of the headquarters building, in which Government and ranger horses are hitched. The cost is as follows: Labor, $38.68; material, $43.78. Total, $82.46.

Public privies.—Sixteen public privies have been built at various places throughout the park at a cost of about $30 apiece.

Hitching rack.—A hitching rack for the accommodation of the public was placed just west of the Yosemite store. The cost is as follows: Labor, $9.48; material, $10.76; total, $20.24.

Improvements to buildings.—A bathroom was added to quarters of Ranger Gaylar, at an expense of $522.74. A bathroom, shelving, ceiling, and cupboard has been made to one of the electrician's quarters, at an expense of $288.45.

EL CAPITAN BRIDGE.

The El Capitan Bridge was replaced by a new combination steel-and-wood truss bridge, having a span of 87½ feet. The bridge was built by the California Construction Co., of San Francisco, Cal. The total cost, including contract price and Government work of hauling and building approaches, is $3,025.

EXTENSIONS TO WATER SYSTEM.

The following improvements have been made to the water system of the valley:

	Cost.
2-inch line to Le Conte Lodge	$154.73
2-inch line to Camp Ahwahnee	206.95
12 drinking hydrants in Camp 7	104.65
8 new sprinkling cranes	127.15
Total	593.48

EXTENSION OF SPRINKLING SYSTEM ALONG THE EL PORTAL ROAD.

In order to furnish water to better sprinkle the first mile of the El Portal Road, an extension of the present 2-inch line, 1,296 feet in length, was made along the road, emptying into a 5,000-gallon tank. From this tank a 3-inch pipe runs along the road for a distance of 2,483 feet and supplies three cranes from which the sprinkling wagons are filled. The work was done at the following expense: Labor, $157.62; materials, $1,462.71; total, $1,620.33.

MAINTENANCE OF WATERWORKS.

The work of maintaining the waterworks system has been very light this season. The distribution system of 8, 6, and 4 inch cast-iron pipes was finished last season and is now in first-class condition, requiring very little attention. Some additional mains should be put in to furnish fire protection to the buildings at Kenneyville and drinking water to Camps 8 and 9.

SANITATION.

The valley has been kept in good sanitary condition with the crude means available. All garbage is burned in pits, which is an effective method of disposal and should be continued as long as fallen timber is available for the burning. Manure is spread on the ground in fields and open places. The public camping grounds were not patronized

this season to the extent they have been heretofore, and the work of keeping the grounds in a sanitary condition has been correspondingly less.

Attention is invited to the lack of a sewerage system in the Yosemite Valley. Most of the sewage finds its way directly into the Merced River, and the pollution of this stream threatens to become a serious matter to the towns below the valley which derive their water from the river. It is suggested that steps be taken toward the design and construction of a modern sewerage system and disposal plant for the Yosemite Valley.

ELECTRICAL AND TELEPHONE WORK.

Attention is invited to the report of Chief Electrician J. W. Emmert, regarding electric and telephone work, which comes under the supervision of this office.

Respectfully,

DAVID A. SHERFEY,
Resident Engineer.

REPORT OF CHIEF ELECTRICIAN.

YOSEMITE, CAL., *September 30, 1915.*

Mr. GEORGE V. BELL,
Superintendent Yosemite National Park.

SIR: I have the honor to submit the following report of the work done by the electrical department of the park during the period from September 23, 1914, to September 23, 1915, inclusive.

POWER PLANT.

The power plant has been operated daily during the past year and there has been no interruption of service. During the summer season 24-hour service was maintained to furnish power for electric irons and motors. The day load has been increased this year by the installation of electric irons in the laundries of the Sentinel Hotel and Camp Yosemite Falls and by the use of several small motors.

The total output for the year was 143,850 kilowatt hours, an increase of 22 per cent over the previous year.

No permanent improvements have been made in the power station during the year, and it is doubtful whether the same continuous service can be maintained unless adequate foundations are placed under the generators and the old water wheel.

A synchronizing indicator was installed on the switchboard so that both generators could be thrown in parallel. This enables us to run both machines together and increase the total output of the plant.

A test for maximum output was made at the power plant on August 22, 1915. The total amount of power we were able to develop at full voltage was 97 kilowatts. This is 25.7 kilowatts more than the peak load carried this year.

WIRING OF YOSEMITE FALLS CAMP.

Yosemite Falls Camp was wired throughout. The office and dining room were each rewired and new lights and fixtures installed. All of the tents were wired and three lights installed in each. Park lights were installed to light the front of each tent and the trails to the toilets. The auxiliary buildings were all wired, and a number of street lights were added to our present street-lighting system to light up the roads to the camp.

A total of 32,950 feet of wire and 835 outlets were installed. The cost was as follows: Labor, $715.28; material and supplies, $1,499.38; total, $2,214.66.

STREET LIGHTS TO HAPPY ISLES.

A series incandescent street lighting circuit was installed between the Sentinel bridge in Yosemite village and Happy Isles. A light was placed on alternate poles. The wires were strung on two-pin cross arms under our transmission line, using the same poles.

The installation consists of one 7½-kilowatt transformer, one 6.6-ampere series regulator, a panel board with ameter and wattmeter, and 41 street-light fixtures with 100-candlepower gas-filled lamps. All of the above were furnished by the General Electric Co. The cost was as follows: Labor, $179.06; materials and supplies, $1,358.27; total, $1,537.33.

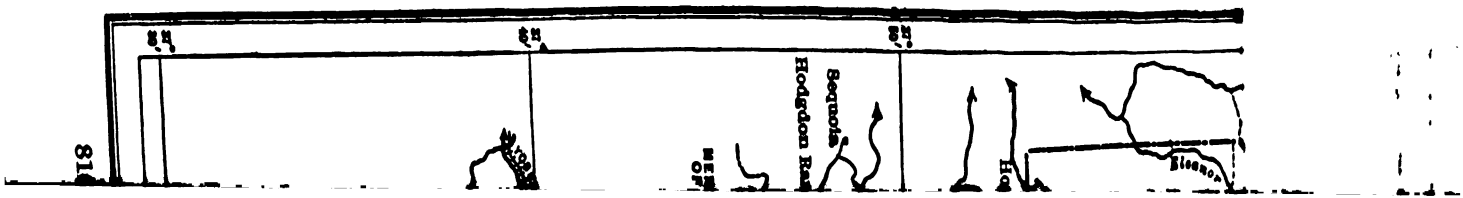
TELEPHONE SYSTEM.

The telephone exchange was operated 24 hours daily from May 1, 1915, and is still in use. We have a total of 66 telephones and 153 miles of telephone lines connected to the board. The ultimate capacity of the exchange is 50 lines, 30 of which are now in use. A number of these lines are overloaded and we are dividing them up as fast as practicable under our present conditions. The lines to Soda Springs and Lake Eleanor outposts are built of No. 14 galvanized-iron wire, which is much too small to withstand the storms. The cost of maintaining these lines is high and reliable service can not be maintained.

NEW TELEPHONE LINES.

A ground return telephone line was built from Yosemite to the junction of the El Portal and Coulterville roads, at which point it was connected to the line built by the Yosemite Transportation Co. The whole line is now used for connection between El Portal and Yosemite. The line was built of No. 9 B. B. galvanized-iron wire, supported on trees by trolleys and glass insulators on brackets. The construction is similar to that used by the Forest Service. The total cost was as follows: Labor, $214; rental of camp equipment, $4.86; material and supplies, $166.59; total, $384.95.

A metallic telephone line was built from Yosemite to Camp Curry, a distance of 1⅛ miles. It was built of No. 9 B. B. iron wire, the construction being similar to that on the El Portal line. This circuit gave Camp Curry an individual line and relieved the congested condition on the wire running to the power station and Lick house. The cost was as follows: Labor, $42.06; materials, $83.40; total, $125.46.


81
Sequoia
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Eleanor

A metallic circuit of like construction was built from Yosemite Creek Bridge to Yosemite Falls Camp. Two telephones were connected to this line, and installed in the office, giving the camp an individual line to the switchboard. The cost was as follows: Labor, $14.83; materials and supplies, $44.60; total, $59.43.

MACHINERY.

The machinery at the wood-cutting plant and pumping stations was kept in repair by the electrical department.

The chemical fire engine and fire extinguishers were kept ready for use.

A record has been kept of the water discharged by the Merced River, Yosemite Creek, and Tenaya Creek.

Respectfully,

JOHN W. EMMERT,
Chief Electrician.

REPORT OF CHIEF PARK RANGER.

YOSEMITE, CAL., *September 30, 1915.*

Mr. GEORGE V. BELL,
Superintendent Yosemite National Park,
Yosemite, Cal.

DEAR SIR: I have the honor to submit the following report of work done by the ranger department of the Yosemite National Park from August 30, 1914, to September 30, 1915:

The ranger department was reorganized under the new park system installed by Mr. Mark Daniels, general superintendent and landscape engineer of national parks, and divided into two classes—mounted men, known as rangers, first class, and automobile checkers, unmounted men, known as rangers, second class. All rangers were required to procure uniforms of the type adopted by the department for the park-ranger service.

The park was divided into nine patrol districts, making the protection against forest fires and poachers a great deal more simple. This system proved its worth this season, as only four forest fires were started within the park boundaries, and the damage done to standing timber was very small.

No poachers were found in the park. Some tourists were lost in the mountains, but under the system of patrol were picked up before they had been subjected to any great exposure or inconvenience. There were also a number of cases of tourists becoming exhausted on the trails. These were cared for by the park rangers in whose districts they were found and were brought to the valley on ranger stock.

A few accidents occurred, but none that were serious. These were caused by tourists leaving trails in trying to make short cuts or in climbing about the face of the cliffs. In these cases they were rescued by the use of a rescue harness built by Park Superintendent George V. Bell.

The park-ranger force consists of a chief park ranger, two assistant chief park rangers, two permanent rangers (first class), and seven temporary rangers (first class) employed for from three to

six months each season, and four temporary rangers (second class) employed as automobile checkers for from four to five months each season.

Respectfully,

O. R. PRIEN, *Chief Park Ranger.*

RULES AND REGULATIONS.

RULES AND REGULATIONS OF MAY 11, 1914.

The following rules and regulations for the government of the Yosemite National Park, including the Yosemite Valley and Mariposa Big Tree Grove, are hereby established and made public, pursuant to authority conferred by the acts of Congress approved October 1, 1890, February 7, 1905, and June 11, 1906:

1. It is forbidden to injure or disturb in any manner any of the mineral deposits, natural curiosities, or wonders on the Government lands within the park.

2. It is forbidden to cut or injure any timber growing on the park lands, or to deface or injure any Government property. Camping parties will be allowed to use dead or fallen timber for fuel. When felling timber, stumps must not be left higher than 12 inches from the ground.

3. Fires should be lighted only when necessary and completely extinguished when not longer required. The utmost care must be exercised at all times to avoid setting fire to the timber and grass.

4. Hunting or killing, wounding or capturing any bird or wild animal on the park lands, except dangerous animals when necessary to prevent them from destroying life or inflicting an injury, is prohibited. The outfits, including guns, traps, teams, horses, or means of transportation used by persons engaged in hunting, killing, trapping, ensnaring, or capturing such birds or wild animals, or in possession of game killed on the park lands under other circumstances than prescribed above, will be taken up by the superintendent and held subject to the order of the Secretary of the Interior, except in cases where it is shown by satisfactory evidence that the outfit is not the property of the person or persons violating this regulation and the actual owner thereof was not a party to such violation. Firearms will only be permitted in the park on written permission from the superintendent thereof. On arrival at the first station of the park guard, parties having firearms, traps, nets, seines, or explosives, will turn them over to the ranger in charge of the station, taking his receipt for them. They will be returned to the owners on leaving the park.

5. Fishing with nets, seines, traps, or by the use of drugs or explosives, or in any other way than with hook and line, is prohibited. Fishing for purposes of merchandise or profit is forbidden. Fishing may be prohibited by order of the superintendent in any of the waters of the park, or limited therein to any specified season of the year, until otherwise ordered by the Secretary of the Interior.

6. No person will be permitted to reside permanently, engage in any business, or erect buildings, etc., upon the Government lands in the park without permission, in writing, from the Secretary of the Interior. The superintendent may grant authority to compe-

tent persons to act as guides and revoke the same in his discretion. No pack trains will be allowed in the park unless in charge of a duly registered guide.

7. Owners of patented lands within the park limits are entitled to the full use and enjoyment thereof. The boundaries of such lands, however, must be determined, and marked, and defined, so that they may be readily distinguished from the park lands. While no limitations nor conditions are imposed upon the use of such private lands so long as such use does not interfere with or injure the park, private owners must provide against trespass by their stock or cattle, or otherwise, upon the park lands, and all trespasses committed will be punished to the full extent of the law. Stock may be taken over the park lands to patented private lands with the written permission and under the supervision of the superintendent, but such permission and supervision are not required when access to such private lands is had wholly over roads or lands not owned or controlled by the United States.

8. Allowing the running at large, herding, or grazing of cattle or stock of any kind on the Government lands in the park, as well as the driving of such stock or cattle over same, is strictly forbidden, except where authority therefor has been granted by the superintendent. All cattle or stock found trespassing on the park lands will be impounded and disposed of as directed in regulations approved February 29, 1908.

9. No drinking saloon or barroom will be permitted upon Government lands in the park.

10. Private notices or advertisements shall not be posted nor displayed on the Government lands within the reservation, except such as may be necessary for the convenience and guidance of the public.

11. It is forbidden to carve or write names or otherwise deface any of the posts, signboards, platforms, seats, railings, steps, boulders, trees, or structures of any kind in the park.

12. Persons who render themselves obnoxious by disorderly conduct or bad behavior, or who may violate any of the foregoing rules, will be summarily removed from the park and will not be allowed to return without permission, in writing, from the Secretary of the Interior or the superintendent of the park.

No lessee or licensee shall retain in his employ any person whose presence in the park shall be deemed and declared by the superintendent to be subversive of the good order and management of the reservation.

13. The superintendent designated by the Secretary is hereby authorized and directed to remove all trespassers from the Government lands in the park and enforce these rules and regulations and all the provisions of the acts of Congress aforesaid.

INSTRUCTIONS OF MAY 11, 1914.

1. Interference with or molestation of any bear or other wild animal in the park in any way by any person not authorized by the superintendent is prohibited.

2. Plants, flowers, shrubs, ferns, etc., growing in the park are for the enjoyment and pleasure of all. The taking of rare specimens is

not permitted. A limited quantity of common varieties may be used for the adornment of dining-room tables, but only by special permission of the superintendent in each case.

3. *Fires.*—The greatest care must be exercised to insure the complete extinction of all camp fires before they are abandoned. All ashes and unburned bits of wood must, when practicable, be thoroughly soaked with water. Where fires are built in the neighborhood of decayed logs, particular attention must be directed to the extinguishment of fires in the decaying mold. Fire may be extinguished where water is not available by a complete covering of earth well packed down. Care should be taken that no lighted match, cigar, or cigarette is dropped in any grass, twigs, leaves, or tree mold. No fires shall be lighted in the Mariposa, Merced, or Tuolumne Big Tree Groves.

4. *Camps.*—No camp will be made except at designated localities. All campers in Yosemite Valley shall first report at the office of the superintendent for assignment to camping sites, and will not change camps without permission; nor shall fires be lighted in Yosemite Valley, except at camp sites, without the express permission of the superintendent. Blankets, clothing, hammocks, or any other article liable to frighten teams must not be hung near the road. The same rule applies to temporary stops, such as for feeding horses or for taking luncheon.

Many successive parties camp on the same sites during the season, and camp grounds must be thoroughly cleaned before they are abandoned. Tin cans must be flattened, and, with bottles, cast-off clothing, and all other débris, must be placed in a garbage can or deposited in a pit provided for the purpose. When camps are made in unusual places where pits may not be provided, all refuse must be hidden where it will not be offensive to the eye. Camping in the Mariposa, Merced, or Tuolumne Big Tree Groves is not permitted.

Campers may purchase cut wood in small quantities at the office of the superintendent.

5. *Mirror Lake.*—No one is allowed to throw anything into Mirror Lake, thereby causing ripples and disturbing the reflection, which all are entitled to behold.

6. *Pedestrians.*—Foot tourists on trails, if seated while animals are passing them, should remain quiet lest they frighten the animals and cause accidents to others. The making of short cuts on trails is prohibited because of damage to trails by so doing and of likelihood of dislodging rocks, which in coursing down might kill or injure some one on a lower level.

7. *Concessioners.*—Livery and transportation concessioners and guides will require their employees to wear each a metal badge with a number thereon, the number and the name corresponding therewith being registered in the superintendent's office. These badges will be worn in plain sight on the left breast of the outer garment.

Concessioners will report to the superintendent the name and address of the nearest relative or friend in the case of each employee as hired, whom the employee wishes to be notified in case of death. Concessioners also will report the fact of discharge of employees; if for cause, such cause shall be stated.

8. *Bicycles.*—The greatest care must be exercised by persons using bicycles. On meeting a team the rider must stop and stand at side of road between the bicycle and the team—the outer side (i. e., the downhill or dangerous side) of the road if on a grade or curve. In passing a team from the rear, the rider should learn from the driver if his horses are liable to frighten, in which case the driver should halt and the rider dismount and walk past, keeping between the bicycle and the team.

9. *Fishing.*—All fish less than 8 inches in length should at once be returned to the water with the least damage possible to the fish. Fish that are to be retained must be at once killed by a blow on the back of the head or by thrusting a knife or other sharp instrument into the head. No person shall catch more than 20 fish in one day.

10. *Dogs and cats.*—Dogs are not permitted in the park, and cats only on special authority.

11. *Stages.*—Stages entering Yosemite Valley shall stop at each hotel or permanent camp in the order of location, so that passengers may exercise the right of selection.

12. *Driving on roads of park.*—(*a*) Drivers of vehicles of any description when overtaken by other vehicles traveling at a faster rate of speed shall, if requested to do so, turn out and give the latter free and unobstructed passageway.

(*b*) Vehicles in passing each other must give full half of the roadway. This applies to freight outfits as well as any other.

(*c*) Freight, baggage, and heavy camping outfits on sidehill grades throughout the park will take the outer side of the road while being passed by passenger vehicles in either direction.

(*d*) Transportation companies, freight and wood contractors, and all other parties and persons using the park roads, will be held liable for violations of these instructions.

(*e*) Mounted men on meeting a passenger team on a grade will halt on the outer side until the team passes. When approaching a passenger team from the rear warning must be given, and no faster gait will be taken than is necessary to make the passage, and if on a grade the passage will be on the outer side. A passenger team must not be passed on a dangerous grade.

(*f*) All wagons used in hauling heavy freight over the park roads must have tires not less than 4 inches in width. This order does not apply to express freight hauled in light spring wagons with single teams.

13. *Miscellaneous.*—Motor cycles are not permitted in the park. Automobiles will be admitted under approved regulations.

The throwing of paper bags or other litter on the ledge trails or at resting places is not permitted. They should be placed in the receptacles provided therefor. Concessioners supplying lunches are required properly to stamp the envelopes with the name of concession.

No person shall ride or drive faster than a walk over any of the Government bridges within the park. Riding or driving at night, except on the floor of the Yosemite Valley, is forbidden.

Persons with animals using trails must keep therein; leaving the trails for the purpose of making short cuts will not be permitted.

Persons are not allowed to bathe near any of the regularly traveled roads in the park without suitable bathing clothes.

It is forbidden to bathe, wash clothes or cooking utensils, or in any other way pollute the waters of the river or creeks above the Sentinel Hotel.

It is forbidden to water stock directly from the river or creeks above the Sentinel Hotel in Yosemite Valley. A bucket or other vessel should be used.

It is forbidden to tie stock within 100 yards of any tent or tent ground. It is forbidden to tie stock so near the river or creeks above the Sentinel Hotel in Yosemite Valley that the stock may enter these streams.

It is forbidden to soil or in any way write upon or mutilate any of the signs or structures erected for public convenience.

To take bark from any live sequoia tree on the park lands is forbidden.

Campers and all others, save those holding license from the Secretary of the Interior, are prohibited from hiring their horses, trappings, or vehicles to tourists or visitors in the park.

All complaints by tourists and others as to service, etc., rendered in the reservation should be made to the superintendent, in writing, before the complainant leaves the park. Oral complaints will be heard daily during office hours.

14. The penalty for disregard of these instructions is summary ejection from the park.

REGULATIONS OF FEBRUARY 29, 1908, GOVERNING THE IMPOUNDING AND DISPOSITION OF LOOSE LIVE STOCK.

Horses, cattle, or other domestic live stock running at large or being herded or grazed in the Yosemite National Park without authority from the Secretary of the Interior will be taken up and impounded by the superintendent, who will at once give notice thereof to the owner, if known. If the owner is not known, notice of such impounding, giving a description of the animal or animals, with the brands thereon, will be posted in six public places inside the park and in two public places outside the park. Any owner of an animal thus impounded may, at any time before the sale thereof, reclaim the same upon proving ownership and paying the cost of notice and all expenses incident to the taking up and detention of such animal, including the cost of feeding and caring for the same. If any animal thus impounded shall not be reclaimed within 30 days from notice to the owner or from the date of posting notices it shall be sold at public auction, at such time and place as may be fixed by the superintendent, after 10 days' notice, to be given by posting notices in six public places in the park and two public places outside the park and by mailing to the owner, if known, a copy thereof.

All money received from the sale of such animals and remaining after the payment of all expenses incident to the taking up, impounding, and selling thereof shall be carefully retained by the superintendent in a separate fund for a period of six months, during which time the net proceeds from the sale of any animal may be claimed by and paid to the owner upon the presentation of satisfactory proof of ownership, and if not so claimed within six months from the date of sale such proceeds shall be turned into the Yosemite National Park fund.

The superintendent shall keep a record in which shall be set down a description of all animals impounded, giving the brands found on them, the date and locality of the taking up, the date of all notices and manner in which they were given, the date of sale, the name and address of the purchaser, the amount for which each animal was sold and the cost incurred in connection therewith, and the disposition of the proceeds.

The superintendent will in each instance make every reasonable effort to ascertain the owner of animals impounded and to give actual notice thereof to such owner.

REGULATIONS OF JANUARY 9, 1915, GOVERNING THE ADMISSION OF AUTOMOBILES.

Pursuant to authority conferred by act of October 1, 1890 (26 Stat., 650), setting aside certain lands in the State of California as a public park, the following regulations governing the admission of automobiles into the Yosemite National Park over the Coulterville, Big Oak Flat, and the Wawona roads are hereby established and made public:

1. *Motor cycles.*—Motor cycles are not permitted to enter the park.

2. *Permits.*—Automobiles traveling within the metes and bounds of Yosemite National Park will be required to secure a permit from the superintendent on arrival at Yosemite, Cal.

3. *Tickets of passage.*—Tickets of passage must be secured from the first ranger station over the road by which the automobile enters the park, payment for which will be made upon presentation of application for permit, with fee, at Yosemite, as outlined in paragraph 4. This ticket must be conveniently kept, so that it can be exhibited to proper park officers on demand, and, with the permit, must be surrendered at the last ranger station on leaving the park. Automobiles that enter the park and do not come to Yosemite village to secure a permit will make payment of $5 in cash at the last ranger station on leaving the park.

4. *Application and fee.*—Application for permit must show (*a*) name of owner, (*b*) license number of automobile, (*c*) name of driver, (*d*) number of passengers, and (*e*) be accompanied by a fee of $5 for a single round trip in and out of the park, payable in cash or money order upon arrival at paying station in the Yosemite village. Checks will not be accepted. An additional fee of $1 will be collected from automobiles entering the Mariposa Grove of Big Trees.

5. *Floor of the valley.*—Motoring on the floor of the Yosemite Valley, except for ingress and egress, is not permitted. Muffler cut-outs must be closed while using automobiles on the floor of the Yosemite Valley.

6. *Distance apart—Gears and brakes.*—Automobiles while in motion must not be less than 100 yards apart. All automobiles, except while shifting gears, must retain their gears constantly enmeshed. Persons desiring to enter the park in an automobile will be required to satisfy the guard issuing the ticket of passage that the brakes of the automobile are in first-class working order, and for this purpose all automobilists will be required effectually to block and skid the

rear wheels with either foot or hand brake, or such other brakes as may be a part of the equipment of the automobile.

7. *Speeds.*—Speeds must be limited to 6 miles per hour in descending steep grades. In ascending, the speed must not exceed 9 miles per hour. On good roads with straight stretches, when approaching teams may be visible, the speed may be increased to 12 miles per hour, but in no case may it exceed 15 miles per hour.

8. *Teams.*—When teams, saddle horses, or pack trains approach, automobiles will take position on outer edge of roadway, regardless of the direction in which they may be going, taking care that sufficient room is left on the inside for the passage of vehicles and animals. Teams have the right of way, and automobiles will be backed or otherwise handled as may be necessary so as to enable teams to pass with safety. Automobiles will stop when teams approach and remain at rest until teams have passed or until the person in charge of the animals is satisfied regarding their safety. If the approaching animals manifest signs of fear, the motor must be stopped and such assistance given by the automobile driver as may be necessary. Signal with horn will be given at or near every turn in the road to announce to drivers of approaching teams or animals the proximity of an automobile.

9. *Route of departure—Checking watches.*—Automobiles may leave the park by any one of the authorized routes of entrance. Automobile drivers should compare their watches with the clocks at checking stations.

10. *Fines.*—Fines or other penalties will be imposed for arrival of automobiles at any point before approved lapse of time, hereinafter given, at the following rates: $0.50 per minute for each of first 5 minutes; $1 per minute for each of the next 20 minutes; $25 fine or ejection from the park, or both, in the discretion of the supervisor of the park, for being more than 25 minutes early.

11. *Penalties.*—Violation of any of the foregoing rules or general regulations for government of the park will cause revocation of permit, and in addition to the penalties hereinbefore indicated will subject the owner of the automobile to any damages occasioned thereby, ejectment from the reservation, and be cause for refusal to issue new permit to the owner without prior sanction in writing from the Secretary of the Interior.

SCHEDULES AND GENERAL INSTRUCTIONS.

Over Coulterville Road—Time of arrival and departure.—Automobiles may leave the Merced Big Tree Grove outpost for Yosemite between the hours of 7 a m. and 3.30 p. m. and must arrive at the Yosemite village pay station not later than 6 p. m. Automobiles leaving the park via the Coulterville Road must start from Yosemite village between the hours of 6 a. m. and 4 p. m. Automobiles using the Coulterville Road may go and come by the Coulterville Grade. Automobiles entering must proceed via the Pohono Bridge, Camp Ahwahnee, Yosemite village, Sentinel Hotel, Camp Curry, Stoneman Bridge, to garage, Camp Lost Arrow, or to the public automobile camping grounds, and may leave in the reverse order.

Schedule over Coulterville Road.

	Distance.	Maximum speed in miles per hour.	Elapsed time between points.
	Miles.		*h. m.*
Merced Grove to Cascade Creek	11.7	10	1 19
Cascade Creek to Pohono Bridge	2.75	8	21
Pohono Bridge to garage	6.58	10	39

Over Wawona Road—Time of arrival and departure.—Automobiles must leave Wawona for Yosemite or Glacier Point between the hours of 6 and 8 a. m. Automobiles must leave Glacier Point for Wawona or Yosemite between the hours of 6 and 8 a. m. Automobiles must leave Yosemite for Wawona or Glacier Point between the hours of 6 and 8 a. m. in order to avoid meeting horse-drawn stages. Automobiles must arrive at Wawona not later than 11.15 a. m. Automobiles must arrive on the floor of the Yosemite Valley at the foot of the Wawona grade near Bridal Veil Falls not later than 12.15 p. m. Automobiles must arrive at Glacier Point not later than 1.45 p. m. Automobiles entering the valley must proceed via the main road, Camp Ahwahnee, Yosemite Village, Sentinel Hotel, Camp Curry, Stoneman Bridge, and Kenneyville to garage, Camp Lost Arrow, or the public automobile camping ground.

Passing of horse-drawn stages.—If an automobile, through accident or other cause, is unable to reach its destination within the allotted period of time, it must park on the outer edge of the road when the time is up and wait until the horse-drawn stages coming in the opposite direction have passed. Necessary information will be obtained from the first stage that passes.

Inbound schedule, Wawona to Garage in Yosemite.

Points.	Distance between points in miles.	Distance from beginning in miles.	Maximum speed in miles per hour.	Minimum or shortest time between points in minutes.	Total time from beginning in—	
					Minutes.	Hours and minutes.
Wawona	0	0				
Camp A. E. Wood [1]	1.2	1.2	15	5	5	5
Chinquapin [1]	11.5	12.7	15	46	51	51
Fort Monroe	6.3	19.0	15	25	76	1 16
Bridalveil	3.1	22.1	6	31	107	1 47
Superintendent's office [1]	4.1	26.2	10	24	131	2 11
Garage [1]	2.7	28.9	10	16	147	2 27

Outbound schedule, Garage in Yosemite to Wawona.

Garage [1]	0	0				
Superintendent's office [1]	2.7	2.7	10	16	16	16
Bridalveil	4.1	6.8	10	24	40	40
Fort Monroe	3.1	9.9	9	20	60	1 00
Chinquapin [1]	6.3	16.2	15	25	85	1 25
Camp A. E. Wood [1]	11.5	27.7	15	46	131	2 11
Wawona	1.2	28.9	15	5	137	2 17

Schedule between Glacier Point and Chinquapin.

Glacier Point [1]	0	0				
Chinquapin [1]	14.2	14.2	15	57	57	57

[1] Checking station.

Over Big Oak Flat Road—Time of arrival and departure.—Automobiles must leave the Crane Flat outpost for Yosemite between the hours of 7 a. m. and 3.30 p. m., and must arrive at the Yosemite village pay station not later than 6 p. m. Automobiles leaving the park via the Big Oak Flat Road must start from Yosemite village between the hours of 6 a. m. and 4 p. m. Automobiles must proceed via the foot of the Big Oak Flat grade, Pohono Bridge, Camp Ahwahnee, Yosemite village, Sentinel Hotel, Camp Curry, Stoneman Bridge, and Kenneyville to garage, Camp Lost Arrow, or public automobile camping ground.

Inbound schedule, Crane Flat to Yosemite over the Big Oak Flat Road.

Points.	Distance between points in miles.	Distance from beginning in miles.	Maximum speed in miles per hour.	Minimum or shortest time between points in minutes.	Total time from beginning in—	
					Minutes.	Hours and minutes.
Crane Flat	0	0				
Gentry's watering trough	8.1	8.1	15	32	32	32
Foot of hill into valley	4.1	12.2	6	41	73	1 13
Pohono Bridge	1.3	13.5	10	8	81	1 21
Superintendent's office	4.9	18.4	10	29	110	1 50
Garage	2.7	21.1	10	16	126	2 6

Outbound schedule, Yosemite to Crane Flat.

Garage	0	0				
Superintendent's office	2.7	2.7	10	16	16	16
Pohono Bridge	4.9	7.6	10	29	45	45
Foot of hill into valley	1.3	8.9	10	8	53	53
Gentry's watering trough	4.1	13.0	9	27	80	1 20
Crane Flat	8.1	21.1	15	32	112	1 52

Mariposa Big Tree Grove.—Automobile drivers desiring to enter the Mariposa Grove of Big Trees must apply to the clerk at the Wawona Hotel for information as to the time of leaving Wawona and to the person in charge of the Log Cabin in the Big Trees as to the time of departure from the grove.

Distance between points in the Yosemite National Park.

	Miles.		Miles.
Merced Grove of Big Trees	0	Pohono Bridge	2.75
Top of Coulterville Slope	9.6	Junction Wawona Road	.847
Old blacksmith shop	1.6	Camp Ahwahnee	3.312
Cascade Creek	.48	Sentinel Hotel	.881
		Camp Curry	1.145
El Portal	0	Kenneyville	.606
Park boundary	1.12	Automobile garage	.93
Cascade Creek	4.84	Camp Lost Arrow	.278

REPORT OF THE SUPERINTENDENT OF THE SEQUOIA AND GENERAL GRANT NATIONAL PARKS.

REPORT OF THE SUPERINTENDENT OF THE SEQUOIA AND GENERAL GRANT NATIONAL PARKS.

DEPARTMENT OF THE INTERIOR,
SEQUOIA AND GENERAL GRANT NATIONAL PARKS,
OFFICE OF SUPERINTENDENT,
Three Rivers, Cal., August 10, 1915.

SIR: I have the honor to submit annual report of the condition of affairs in and the management of the Sequoia and General Grant National Parks from October 1, 1914, to the present date:

GENERAL STATEMENT.

The Sequoia National Park, set aside by act of September 25, 1890 (26 Stat., 478), and act of October 1, 1890 (26 Stat., 650), is located in Tulare County, Cal. It has an area of 161,597 acres and ranges in altitude from 1,100 feet to 11,900 feet. The General Grant National Park, set aside by act of October 1, 1890 (26 Stat., 650), is located one-half in Tulare County and one-half in Fresno County, Cal. It has an area of 2,536 acres and ranges in altitude from 5,250 feet to 7,631 feet. The Sequoia National Park derives its name and much of its interest from the presence of many large groves of "big trees" (*Sequoia washingtoniana*), and the General Grant National Park was thus named by reason of the "General Grant tree," so widely known for its size and beauty. Both of these parks are situated on the western slope of the Sierra Nevada and contain some of the most rugged alpine scenery to be found on the continent. The magnificent forests within their borders are but one of their many striking features. There are innumerable forms and varieties of indescribable beauties contained in their rugged mountain tops, the cascades and falls, lakes, caves, and verdant meadows containing many wild flowers, ferns, and mosses.

GENERAL CONDITIONS.

The rainfall and snowfall during the winter of 1914–15 were somewhat above the normal, resulting in much damage to roads and trails. Repair and improvement work was commenced on roads, trails, and telephone lines on April 20 and completed by June 30. The parks were opened for accommodation of the public on June 1, at which time all concessionaires began active operations. There are hotels, stores, feed yards, post-offices, telephone stations, and photograph galleries in each of the parks, and regular transportation service operating between Lemon Cove railroad station and Camp Sierra in

the Sequoia Park and between Sanger railroad station and General Grant Park. The distance from Lemon Cove to Camp Sierra is 40 miles and from Sanger to General Grant Park 46 miles.

IMPROVEMENT WORK.

The following improvement work has been accomplished in the Sequoia and General Grant National Parks since last report:

SEQUOIA PARK.

A 3,000-foot road as driveway around outer border and through the tourist camp at Camp Sierra has been built. A water-pipe system 1¼ miles in length, bringing water from Sherman Creek to Camp Sierra tourist camp, has been laid. The location survey and cross-sectioning thereof of the Ranger-North Park Line Road between Wolverton Reservoir and the north boundary of the park, 9½ miles in length, has been completed. Twenty-three miles of the Giant Forest Road were graded; six additional passing points for vehicles were constructed and new retaining walls put in; landslides and objectionable rocks were cleared from right of way. Fifty-three miles of the South Fork Trail and intersecting trails have been repaired and are in good condition. Thirty-three miles of the Giant Forest telephone line and 32 miles of the South Fork telephone lines have been repaired.

GENERAL GRANT PARK.

The main tourist camp ground, consisting of 35 acres, has been fenced with steel woven wire attached to cedar posts. Five miles of Stephens Grade-North Park Road were graded and brought to uniform grade. One and one-half miles telephone line has been repaired.

GUARDING THE PARKS.

The superintendent is assisted throughout the year by three permanent park rangers and during the summer months by eight additional park rangers in Sequoia Park and by one permanent park ranger in General Grant Park. Regular and constant patrols are made by these men in all parts of the reservations. Four of the above temporary park rangers were detailed to various road and trail entrances to the Sequoia Park, where watchfulness was constantly exercised over traffic, disposition of firearms, and the issuing of instructions to and the registration of park visitors.

PARK VISITORS.

Visitors in general are inclined to observe the park rules and regulations, but occasionally there are some exceptions. More persons visited the parks this season than during any previous year. Between March 1 and August 10 there were 5,002 visitors to Sequoia Park, of whom 2,203 remained for a period of three days or more and 2,799 for a shorter period.

Travel to Sequoia National Park by different entrances.

Giant Forest Road	2,001
Elk Park Road	1,462
Mineral King Road	933
South Fork Trail	128
Quinn-Little Kern Trail	85
Kings River Trail	116
Black Oak Trail	46
Halstead Meadow Trail	87
Hockett-Tar Gap Trail	118
Seven-Mile Hill Trail	76
Total	5,002

Means of transportation to Sequoia National Park.

Sequoia National Park Transportation Co., automobile stage	109
Automobile	1,003
Motorcycle	5
Wagon	1,660
Mounted on horse	1,926
Afoot	299
Total	5,002

Residence of visitors to Sequoia National Park.

United States:	
Alabama	31
Alaska	52
Arizona	11
Arkansas	3
California	4,289
Connecticut	4
Colorado	16
District of Columbia	22
Delaware	6
Florida	21
Georgia	16
Hawaii	3
Idaho	12
Illinois	56
Indiana	54
Iowa	51
Kansas	117
Kentucky	23
Louisiana	10
Maine	12
Michigan	29
Massachusetts	5
Maryland	6
Minnesota	11
Missouri	10
Nebraska	22
New Jersey	12
New York	21
Ohio	14
Oregon	9
Texas	6
Wyoming	5
Washington	8
Wisconsin	11
Total	4,978
Foreign countries:	
China	4
Japan	3
Mexico	4
England	11
Germany	2
Total	24
Grand total	5,002

Between April 1 and August 10 there were 7,022 visitors to General Grant Park, of whom 2,128 remained for a period of three days or more and 4,894 remained for shorter period.

Travel to General Grant National Park by different entrances.

Stephens Grade Road	6,464
Millwood Road	254
Lake Road	203
Halstead Meadow Trail	101
Total	7,022

Means of transportation to General Grant National Park.

Kings River-Hume Auto Service Co	698
Automobile	5,019
Wagon	522
Mounted, horse	251
Motorcycle	35
Afoot	502
Total	7,022

Residence of visitors to General Grant National Park.

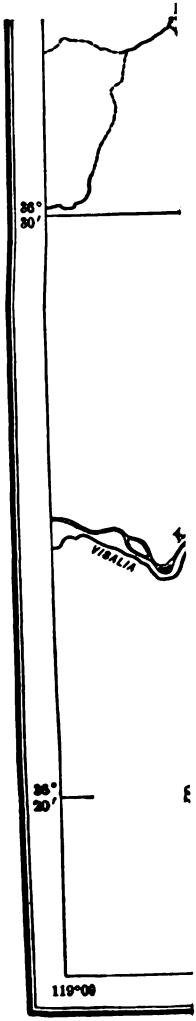
United States:		United States—Continued:	
Alabama	10	Missouri	162
Alaska	17	Nebraska	98
Arizona	22	New Jersey	21
Arkansas	16	New York	64
California	5,673	Ohio	102
Connecticut	32	Oregon	8
Colorado	17	Texas	12
District of Columbia	12	Wyoming	4
Delaware	12	Washington	16
Florida	17	Wisconsin	14
Georgia	19	Total	6,974
Hawaii	7		
Idaho	47		
Illinois	114	Foreign countries:	
Indiana	89	Australia	3
Iowa	106	Canada	16
Kansas	102	England	8
Kentucky	29	Germany	12
Louisiana	12	Ireland	4
Maine	31	Mexico	3
Michigan	17	South Africa	2
Massachusetts	11	Total	48
Maryland	12	Grand total	7,022
Minnesota	49		

PERMITS.

The following permits to drive cattle across Sequoia Park on Mineral King Road to the national forest east of the park were granted: J. E. Barton, 100 head; John Hamilton, 105 head; Blick Bros., 100 head; Walter Braddock, 115 head; Alfred Hengst, 130 head; Guy Hopping, 115 head.

HOTELS AND CAMPS.

Free camping privileges are permitted throughout the reservations at the various camping places, of which there are many. The principal tourist camp for the Sequoia Park is maintained at Giant Forest, in the northern portion of the park, under concession from the department by Mr. Walter E. Kenney, who conducts a hotel and tent camp, at which place 409 persons received accommodations during the season. The tourist camp for the General Grant Park is centrally located. A hotel with tent accommodations is maintained at this camp by Mrs. Mattie Decker, at which place 998 persons received accommodations during the season.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MAMMALS.

The abundance of mammals or birds in a wild state is determined largely by the quantity and character of food that nature provides. The Sequoia and General Grant National Parks are favored in this respect, furnishing an abundance of the food necessary for both mammals and birds.

Mammal life in the Sequoia and General Grant National Parks is more abundant and of greater variety than a casual observer would think possible, as a great portion of them are crepuscular and nocturnal in habit, and as the consequence are seldom seen by the park visitors.

Altogether 51 kinds of mammals are native to the parks, made up of the following species: Elk, deer, mountain sheep, squirrels, flying squirrels, rats, mice, pocket gophers, pocket rats, pocket mice, jumping mice, porcupine, pica, hares, rabbits, bear, wolves, foxes, mountain lion, lynx, ring-tailed cat, raccoon, wolverine, skunks, martin, fisher, weasels, moles, shrews, and bats.

There is a marked increase from year to year in practically all the food-bearing mammals and decrease in all predatory and harmful species of rodent mammals, as the two latter mentioned are constantly being killed by the park rangers whenever opportunity offers. All game mammals are quite tame and are a source of very great pleasure to the park visitors.

BIRDS.

The Sequoia and General Grant National Parks are the home of both migratory and breeding birds. Millions of these creatures either make their nests or spend several weeks of each year within the parks, and since once having found such a place they continue to come in ever-increased numbers, and have a tendency to spread out from the locality.

Owing to the topography of the parks and their varied climatic conditions, birds of both the torrid and frigid zones come to them. There is a constant movement of the birds north and south, and from the high mountains to the lower and from the lowlands to the higher elevations.

One hundred and ninety-four species of bird life are known to inhabit the parks, made up of the following: Loons, cormorant, ducks, geese, swan, herons, bitterns, coot, stilt, snipe, sandpipers, killdeer, plover, partridges, grouse, pheasant, wild turkey, wild pigeon, dove, condor, vulture, hawks, eagles, owls, cuckoos, kingfisher, woodpeckers, goatsuckers, swifts, humming birds, flycatchers, lark, crow, raven, jays, magpie, blackbirds, oriole, finches, sparrows, grosbeaks, siskin, juncoes, towhees, buntings, tanager, swallows, waxwing, phainopepla, shrike, vireos, warblers, wagtail, dipper, mocking bird, thrashers, wrens, creepers, nuthatches, titmice, kinglets, gnat catchers, thrushes, solitaire, robin, and bluebirds.

A few of the above species are rare and seldom seen, but as a rule birds occur very abundantly in the parks at all seasons and are a source of gratification to the park visitors.

FISH.

Fishing was fairly good throughout the season and a great many persons availed themselves of this sport. The heavy drain on some of the waters would indicate necessity of their being restocked next year.

FOREST CONDITIONS.

The forests of the parks are all in healthy condition and fair state of preservation and reproductiveness. The attack that was started last year on the red fir (*Abies magnifica*) in the Sequoia Park by a bark aphid of the genus *Lachnus* has practically ceased, the insects having apparently been destroyed by their natural enemy. No new outbreaks of insect enemies of the forests have been detected.

FOREST FIRES.

One fire, cause unknown, was detected soon after its origin just west of Camp Sierra tourist camp in Sequoia Park on July 30, but was extinguished by campers before damage was done. Three fires that occurred on the national forest domain just west of and in near vicinity of the Sequoia Park were extinguished by volunteer fire fighters, forest and park rangers, prior to their entering the park.

EXTENSION OF PARK BOUNDARIES.

The subject of extending the boundaries of the Sequoia National Park so as to include Mount Whitney, the Kern and Kings River Canyons, is one that is now attracting the attention of the citizens of both State and Nation. Quite a number of new boundaries have been proposed, but I am of the opinion that the following boundary suggested by Mr. R. B. Marshall, chief topographer, Geological Survey, would be most desirable:

Beginning at a point on the range line between ranges 31 and 32 east, in township 18 south, of the Mount Diablo base and meridian, being a point on the present eastern boundary of the Sequoia National Park where it crosses the hydrographic divide between Little Kern River and Soda Creek; thence southeasterly along the hydrographic divide between Little Kern River and Soda Creek to the junction of Little Kern River and Quail Creek; thence easterly along the hydrographic divide between Quail Creek and Lion Creek to the summit of the Great Western Divide; thence southeasterly along the Great Western Divide to Coyote Peak; thence easterly along the hydrographic divide to the junction of Kern River and Little Creek, about one-half mile south of Kern Lake and between that lake and Little Lake; thence easterly along the main divide south of Little Creek and between Golden Trout Creek and Cold Creek (tributaries of Kern River) to the summit of Kern Peak; thence northerly and easterly along the hydrographic divide between South Fork of Kern River and Golden Trout Creek to the summit of the Sierra Nevada; thence northerly along the main crest of the Sie[illegible] Creek Pass at the head of Piute Creek; thence f[illegible] Piute Creek [illegible]th French Can-

yon to junction of the South Fork of San Joaquin River and Piute Creek; thence southerly along the main hydrographic divide to the summit of Mount Henry; thence southeasterly along the hydrographic divide between the drainage of the South Fork of the San Joaquin River and the drainage of the North Fork of Kings River to the junction with Goddard Divide; thence southerly and westerly along the hydrographic divide between Goddard Creek and the drainage of North Fork of Kings River, and along the divide between Crown Creek and Blue Canyon Creek, along Kettle Ridge to Kettle Dome; thence southwesterly along the hydrographic divide to the junction of Crown and Fawn Creeks; thence westerly along the hydrographic divide between Fawn Creek and Rodgers Creek to Oblisk Peak; thence westerly along the main hydrographic divide south of Rodgers Creek to Spanish Mountain; thence southerly along the hydrographic divide (Deer Ridge) to the junction of the South and Middle Forks of Kings River; thence southerly along the hydrographic divide between Tenmile Creek and Lockwood Creek and along the Sequoia and Big Baldy Ridges to Big Baldy; thence southerly along the hydrographic divide (Big Baldy Ridge) to the junction of Redwood Creek and the North Fork of Kaweah River; thence following down the east bank of the North Fork of Kaweah River to the junction of Cactus Creek; thence southeasterly along the hydrographic divide between Cactus Creek, Maple Creek, and the North Fork of the Kaweah River to Ash Peaks; thence southerly along the hydrographic divide west of Alder Creek to the junction of the Middle and East Forks of Kaweah Rivers; thence south and easterly along the hydrographic divide between the East Fork of Kaweah River and Salt Creek, over Red Hill, to Case Mountain; thence easterly along the hydrographic divide (Salt Creek Ridge) between the South and East Forks of Kaweah River to Homers Nose; thence southwesterly along the hydrographic divide east of Bennett and Burnt Camp Creeks to the junction of Burnt Camp Creek and the South Fork of Kaweah River; thence southeasterly along the hydrographic divide to Dennison Mountain; thence easterly along the hydrographic divide (Dennison Ridge) between the South Fork of Kaweah River, the North Fork of Tule River, and the North Fork of the Middle Fork of Tule River to Sheep Mountain; thence northeasterly along the hydrographic divide between the South Fork of Kaweah River, Pecks Canyon, Soda Creek, and Little Kern River to the place of beginning.

This proposed boundary is a natural one, formed by many mountain ridges. The new territory to be acquired is now national-forest domain, is of little value commercially, and of very great value as a national park. Its natural beauties are many and unsurpassed; it is a natural game preserve; there are no agricultural lands within the indicated boundary, and only sufficient grazing for the tourists' stock and the game that would inhabit the region if hunting thereon was prohibited.

The setting aside of this region for a national park and the building of roads therein, thus making accessible for tourist travel, would therefore result in no economic loss, but in the incalculable economic gain of bringing to the region thousands of visitors who spend their money elsewhere.

CONCESSIONS.

The following concessions were held in the Sequoia and General Grant National Parks under leases and permits during the season of 1915:

Concessions, Sequoia and General Grant National Parks.

Name of concessioner.	Privilege granted with date of issue thereof.	Expiration of lease or permit.	Annual rental.
Contract.	SEQUOIA NATIONAL PARK.		
Mount Whitney Power & Electric Co.	Construction and operation of power plants and lines, and right of way for power lines for generation of electricity. Issued Mar. 5, 1912. Compensation exacted, 10 cents per horsepower first year, increasing 10 cents per horsepower each year until tenth year; $1 per horsepower thereafter.	(1)	
	Lower plant completed (upper plant in course of construction), charge fourth year on 1,198 horsepower at 40 cents.	.....	$479.20
Modification.	On June 22, 1915, secs. 4, 5, 6, and 7 of the contract of Mar. 5, 1912, were so modified as to provide for the payment, from July 1, 1915, of ½ mill per kilowatt hour of electrical energy developed at plant already built as well as that proposed to be constructed. Semiannual payment is to be made during July and January in each year beginning in January, 1916, for the preceding six months' period. If yearly payment does not aggregate following minimum amounts, then, regardless of output, the company shall pay in January for preceding year, less any payment made in July, $2,500 for 1915, and also for 1916, and $7,500 for each year thereafter. The time for completion of the Wolverton dam extended to Dec. 22, 1916.		
Permits.			
Walter E. Kenney.....	Tourist camp and transportation of passengers. Issued Feb. 25, 1915, for period June 15 to Nov. 1, 1915.	Nov. 1, 1915	50.00
C. F. Keller.....	General store and feed yard. Issued Mar. 3, 1915, for one year from June 1, 1915.	May 31, 1916	5.00
Lindley Eddy.....	Photographic privilege, including sale of supplies. Issued June 2, 1915, for one year from June 1, 1915.	.....do.....	20.00
Geo. F. Belden.....	Photographic privilege, including sale of supplies. Issued July 8, 1915, for one year from June 1, 1915.	.....do.....	20.00
Sequoia National Park Transportation Co.	Stage line between Lemon Cove and Camp Sierra. Issued Apr. 3, 1915, for period June 1 to Nov. 1, 1915.	Nov. 1, 1915	50.00
Mount Whitney Power & Electric Co.	Maintenance of camps for housing workmen and supplies in connection with Wolverton reservoir. Right granted to occupy 320 acres of land and to construct buildings thereon, etc. No payment exacted, company being required to police lands used and assist park supervisor in enforcement of park regulations. Buildings erected to be turned over to Government. Approved Feb. 24, 1914.	Oct. 31, 1915	None.
	GENERAL GRANT NATIONAL PARK.		
Mattie Decker.....	General store, hotel, and feed yard. Issued Feb. 11, 1915, for one year from June 1, 1915.	May 31, 1916	50.00
H. E. Roberts.....	Photographic privilege, including sale of supplies. Issued June 19, 1915, for one year from June 1, 1915.	.....do.....	20.00
Kings River-Hume Auto Service Co.	Transportation passengers and freight by automobile. Issued Apr. 28, 1915, for one year from June 1, 1915.	.....do.....	45.00

[1] Issued for indeterminate period.

Motor-driven vehicle permits.

SEQUOIA NATIONAL PARK.

136 automobiles (round trip), at $5	$680.00
90 automobiles (round trip), at $2.50	225.00
1 automobile (season permit), at $10	10.00

1 motorcycle (round trip), at $5	$5.00
5 motorcycles (round trip), at $2.50	12.50
	532.50
Less transmission fee	3.14
Total	929.36

GENERAL GRANT NATIONAL PARK.

1,164 automobiles (round trip), at $1	$1,164.00
14 automobiles (season permits), at $5	70.00
35 motorcycles, at $1	35.00
	1,269.00
Less transmission fee	4.52
Total	1,264.48

WEATHER CONDITIONS.

The past season was a dry one; there was no rain on the area of the parks after May 28. The weather was generally clear, and the atmosphere cool and pleasant.

EMPLOYEES.

The park rangers, Messrs. C. W. Blossom, John G. von Grunigen, Carl W. Keller, as regular rangers, and Messrs. H. T. Britten, I. D. Mullenix, Frank P. Dorr, G. W. Hankins, H. H. Higgins, H. Y. Alles, John M. Ball, R. F. Dillon, as temporary rangers of Sequoia Park, Milo S. Decker, as regular ranger of General Grant Park, and Mrs. Bessie O. MacKinnon, as clerk to the office of superintendent, are all zealous, capable, and well fitted for the duties they occupy.

COMPLAINTS.

No complaints have been made to this office as to the treatment received or the conduct of any park officer or concessioner.

RECOMMENDATIONS.

I desire to renew my recommendations of last year: (1) That United States Congress be requested to provide measures whereby title to the deeded land within the Sequoia and General Grant National Parks be acquired by the United States Government; (2) that the principles of compensation to injured employees be applied to those employees of the Sequoia and General Grant Naticnal Parks; (3) that the State of California be requested to cede to the United States Government entire jurisdiction of the Sequoia and General Grant National Parks.

Very respectfully,

WALTER FRY, *Superintendent.*

The SECRETARY OF THE INTERIOR,
Washington, D. C.

RULES AND REGULATIONS.

SEQUOIA NATIONAL PARK.

General Regulations of March 30, 1912.

1. By act of Congress, approved September 25, 1890, the tract of land in the State of California described in township 18 south and ranges 30 and 31 east, and also sections 31, 32, 33, and 34, in township 17 south and range 30 east, and by act of Congress approved October 1, 1890, the adjoining tract described as townships 15 and 16 south, ranges 29 and 30 east, and also township 17 south, range 30 east, except above-mentioned sections 31, 32, 33, and 34, have been set apart for a public park, and the same shall be known as the Sequoia National Park.

2. The park by said act is placed under the exclusive control of the Secretary of the Interior, and these rules and regulations are made and published in pursuance of the duty imposed on him in regard thereto.

3. It is forbidden to injure or disturb in any manner any of the mineral deposits, natural curiosities, or wonders on the Government lands within the park.

4. It is forbidden to cut or injure any timber growing on the park lands. Camping parties will be allowed to use dead or fallen timber for fuel.

5. Fires shall be lighted only when necessary and completely extinguished when not longer required. The utmost care must be exercised at all times to avoid setting fire to the timber and grass.

6. Hunting or killing, wounding, or capturing any bird or wild animal on the park lands, except dangerous animals when necessary to prevent them from destroying life or inflicting an injury, is prohibited. The outfits, including guns, traps, teams, horses, or means of transportation used by persons engaged in hunting, killing, trapping, ensnaring, or capturing such birds or wild animals, or in possession of game killed on the park lands under other circumstances than prescribed above, will be taken up by the superintendent and held subject to order of the Secretary of the Interior, except in cases where it is shown by satisfactory evidence that the outfit is not the property of the person or persons violating this regulation and the actual owner thereof was not a party to such violation. Firearms will only be permitted in the park on written permission from the superintendent thereof.

7. Fishing with nets, seines, traps, or by the use of drugs or explosives, or in any other way than with hook and line, is prohibited. Fishing for purposes of merchandise or profit is forbidden. Fishing may be prohibited by order of the superintendent of the park in any of the waters of the park, or limited therein to any specified season of the year, until otherwise ordered by the Secretary of the Interior.

8. No person will be permitted to reside permanently or to engage in any business on the Government lands in the park without permission, in writing, from the Secretary of the Interior. The superintendent may grant authority to competent persons to act as guides

and revoke the same in his discretion, and no pack trains shall be allowed in the park unless in charge of a duly registered guide.

9. Owners of patented lands within the park limits are entitled to the full use and enjoyment thereof; the boundaries of such lands, however, must be determined, and marked and defined, so that they may be readily distinguished from the park lands. While no limitations or conditions are imposed upon the use of such private lands so long as such use does not interfere with or injure the park, private owners must provide against trespass by their stock or cattle, or otherwise upon the park lands, and all trespasses committed will be punished to the full extent of the law. Stock may be taken over the park lands to patented private lands with the written permission and under the supervision of the superintendent, but such permission and supervision are not required when access to such private lands is had wholly over roads or lands not owned or controlled by the United States.

10. Allowing the running at large, herding, or grazing of cattle or stock of any kind on the Government lands in the park as well as the driving of such stock or cattle over same, is strictly forbidden, except where authority therefor has been granted by the superintendent. All cattle or stock found trespassing on the park lands will be impounded and disposed of as directed in regulations approved March 30, 1912.

11. The sale or use of intoxicating liquors on the Government lands in the park is strictly forbidden.

12. Private notices or advertisements shall not be posted or displayed on the Government lands within the reservation, except such as may be necessary for the convenience and guidance of the public.

13. Persons who render themselves obnoxious by disorderly conduct or bad behavior, or who may violate any of the foregoing rules, may be summarily removed from the park and will not be allowed to return without permission, in writing, from the Secretary of the Interior or the superintendent of the park.

14. The superintendent designated by the Secretary is hereby authorized and directed to remove all trespassers from the Government lands in the park and enforce these rules and regulations and all the provisions of the act of Congress aforesaid.

Instructions of March 30, 1912.

1. Interference with or molestation of any bird, bird's nest, or wild animal on the park lands in any way by any person not authorized by the superintendent is prohibited.

2. The wanton destruction of wild flowers, plants, or shrubs growing on the park lands is forbidden.

3. *Fires.*—The greatest care must be exercised to insure the complete extinction of all camp fires before they are abandoned. All ashes and unburned bits of wood must, when practicable, be thoroughly soaked with water. Where fires are built in the neighborhood of decayed logs, particular attention must be directed to the extinguishment of fires in the decaying mold. Fire may be extinguished where water is not available by a complete covering of earth well packed down. Care should be taken that no lighted match, cigar, or cigarette is dropped in any grass, twigs, leaves, or tree mold.

4. *Camps.*—In selecting a camping ground its location should be sufficiently distant from the water source, stream, or spring as not to be objectionable to those who may wish to camp in the vicinity and use the same water source at the same time. Blankets, clothing, hammocks, or any other article liable to frighten teams must not be hung near the road.

Camp grounds must be kept in sanitary and neat condition at all times, and upon their abandonment all kitchen refuse, cast-off wearing apparel, tin cans, paper boxes, etc., must be deposited in a pit provided for the purpose. When camps are made at unusual places where pits may not be provided, all refuse must be hidden where it will not be offensive, to the end that the site will be suitable for use by future campers.

5. *Bicycles.*—The greatest care must be exercised by persons using bicycles. On meeting a team the rider must stop and stand at side of road between the bicycle and the team—the outer side of the road if on a grade or curb. In passing a team from the rear, the rider should learn from the driver if his horses are liable to frighten, in which case the driver should halt and the rider dismount and walk past, keeping between the bicycle and the team.

6. *Fishing.*—All fish less than 8 inches in length should at once be returned to the water with the least damage possible to the fish. Fish that are to be retained must be at once killed by a blow on the back of the head, or by thrusting a knife or other sharp instrument into the head. No person shall catch more than 20 fish in one day.

7. *Dogs and cats.*—Cats are not permitted on the park lands, and dogs only to those persons passing through the park to the territory beyond, in which instances they must be kept tied while crossing the park. This rule does not apply to trained dogs used by Government employees in extermination of predatory wild animals, or to those used by cattlemen holding permits from the Department of the Interior to assist in driving their herds on Mineral King Road.

8. *Dead animals.*—All domestic animals that may die on the park lands at any tourist camp, or along any of the public thoroughfares, must be immediately removed to a point not nearer than one-fourth mile from such camp or thoroughfare, and there be buried at least 2 feet beneath the ground by the owner or person having charge of such animal.

9. *Driving on roads of park.*—(*a*) Drivers of vehicles of any description when overtaken by other vehicles traveling at a faster rate of speed, shall, if requested to do so, turn out and give the latter free and unobstructed passageway.

(*b*) Vehicles in passing each other must give full half of the roadway. This applies to freight outfits as well as any other.

(*c*) Freight, baggage, and heavy camping outfits will take the outer side of the road when being passed by passenger vehicles in either direction.

(*d*) Transportation companies and all other parties and persons using the park roads will be held liable for violations of these instructions.

(*e*) Mounted men on meeting a passenger team on grade will halt on the outer side until the team passes. When approaching a passenger team from the rear warning must be given, and no faster gait will be taken than is necessary to make the passage; and if on a

grade, the passage will be on the outer side. A passenger team must not be passed on a dangerous grade.

10. *Miscellaneous.*—Automobiles and motorcycles are not permitted in the park.

No person shall ride or drive faster than a walk over any of the Government bridges within the park. Riding or driving at night other than in cases of emergency is forbidden.

Persons with animals using trails must keep therein. Leaving the trails for the purpose of making short cuts will not be permitted.

It is forbidden to wash clothing or cooking utensils or in any other way pollute the waters of the rivers and creeks of the parks, or to bathe in any of the streams near the regularly traveled thoroughfares in the park without suitable bathing clothes.

It is forbidden to water stock directly from the river or creeks above any tourist camp. A bucket or other vessel should be used.

It is forbidden to tie stock so as to permit their entering any of the streams of the parks. All animals should be kept a sufficient distance from camping grounds not to litter the ground and make unfit for use the area which may be used later as tent sites.

It is forbidden for anyone to soil or in any way write upon or mutilate any of the signs or structures erected for public convenience.

It is forbidden to take bark from any live sequoia tree on the park lands.

Campers and all others, save those holding licenses from the Secretary of the Interior, are prohibited from hiring their horses, trappings, or vehicles to tourists or visitors in the park.

All complaints by tourists and others as to service, etc., rendered in the reservation should be made to the superintendent, in writing, before the complainant leaves the park.

11. The penalty for disregard of these instructions is summary ejection from the park.

REGULATIONS OF MARCH 30, 1912, GOVERNING THE IMPOUNDING AND DISPOSITION OF LOOSE LIVE STOCK FOUND IN THE SEQUOIA AND GENERAL GRANT NATIONAL PARKS.

Horses, cattle, or other domestic live stock running at large or being herded or grazed on the Government lands in the Sequoia and General Grant National Parks without authority from the superintendent of the park will be taken up and impounded by the superintendent, who will at once give notice thereof to the owner, if known. If the owner is not known, notices of such impounding, giving a description of the animal or animals, with the brands thereon, will be posted in six public places inside the park and in two public places outside the park. Any owner of an animal thus impounded may at any time before the sale thereof reclaim the same upon proving ownership and paying the cost of notice and all expenses incident to the taking up and detention of such animal, including the cost of feeding and caring for the same. If any animal thus impounded shall not be reclaimed within 30 days from notice to the owner or from the date of posting notices, it shall be sold at public auction at such time and place as may be fixed by the superintendent after 10 days' notice, to be given by posting notices in six public places in the park and two public places outside the park and by mailing to the owner, if known, a copy thereof.

All money received from the sale of such animals and remaining after the payment of all expenses incident to the taking up, impounding, and selling thereof, shall be carefully retained by the superintendent in a separate fund for a period of six months, during which time the net proceeds from the sale of any animal may be claimed by and paid to the owner upon the presentation of satisfactory proof of ownership; and if not so claimed within six months from the date of sale such proceeds shall be turned into the park funds of the Sequoia and General Grant National Parks, respectively.

The superintendent shall keep a record in which shall be set down a description of all animals impounded, giving the brands found on them, the date and locality of the taking up, the date of all notices and manner in which they were given, the date of sale, the name and address of the purchaser, the amount for which each animal was sold and the cost incurred in connection therewith, and the disposition of the proceeds.

The superintendent will, in each instance, make every reasonable effort to ascertain the owner of animals impounded and to give actual notice thereof to such owner.

GENERAL GRANT NATIONAL PARK.

General Regulations of March 30, 1912.

1. By act of Congress approved October 1, 1890, the tract of land in the State of California described as sections 5 and 6, in township 14 south, range 28 east of Mount Diablo meridian, and also sections 31 and 32, of township 13 south, range 28 east of the same meridian, have been set apart for a public park, and the same shall be known as the "General Grant National Park," "General Grant" being the name by which the great tree therein is so widely known.

All other provisions of the General Grant National Park regulations are the same as those for Sequoia National Park.

Instructions of March 30, 1912.

1. Interference with or molestation of any bird, bird's nest, or wild animal on the park lands in any way by any person not authorized by the superintendent is prohibited.

2. The wanton destruction of wild flowers, plants, or shrubs growing on the park lands is forbidden.

3. *Fires.*—The greatest care must be exercised to insure the complete extinction of all camp fires before they are abandoned. All ashes and unburned bits of wood must, when practicable, be thoroughly soaked with water. Where fires are built in the neighborhood of decayed logs, particular attention must be directed to the extinguishment of fires in the decaying mold. Fire may be extinguished where water is not available by a complete covering of earth well packed down. Care should be taken that no lighted match, cigar, or cigarette is dropped in any grass, twigs, leaves, or tree mold.

4. *Camps.*—In selecting a camping ground its location should be sufficiently distant from the water source, stream, or spring as not to be objectionable to those who may wish to camp in the vicinity and

use the same water source at the same time. Blankets, clothing, hammocks, or any other article liable to frighten teams must not be hung near the road.

Camp grounds must be kept in sanitary and neat condition at all times, and upon their abandonment all kitchen refuse, cast-off wearing apparel, tin cans, paper boxes, etc., must be deposited in a pit provided for the purpose. When camps are made at unusual places where pits may not be provided, all refuse must be hidden where it will not be offensive, to the end that the site will be suitable for use by future campers.

5. *Bicycles.*—The greatest care must be exercised by persons using bicycles. On meeting a team the rider must stop and stand at side of road between the bicycle and the team—the outer side of the road if on a grade or curb. In passing a team from the rear, the rider should learn from the driver if his horses are liable to frighten, in which case the driver should halt and the rider dismount and walk past, keeping between the bicycle and the team.

6. *Fishing.*—All fish less than 8 inches in length should at once be returned to the water with the least damage possible to the fish. Fish that are to be retained must be at once killed by a blow on the back of the head or by thrusting a knife or other sharp instrument into the head. No person shall catch more than 20 fish in one day.

7. *Dogs and cats.*—Cats are not permitted on the park lands, and dogs only to those persons passing through the park to the territory beyond, in which instances they must be kept tied while crossing the park. This rule does not apply to trained dogs used by Government employees in extermination of predatory wild animals.

8. *Stages.*—Stages carrying passengers through the General Grant National Park shall stop at the main tourist camp, in order that passengers wishing accommodations will not be compelled to walk to the crossroads, one-fourth mile distant.

9. *Dead animals.*—All domestic animals that may die on the park lands at any tourist camp or along any of the public thoroughfares must be immediately removed to a point not nearer than one-fourth mile from such camp or thoroughfare and there be buried at least 2 feet beneath the ground by the owner or person having charge of such animal.

10. *Driving on roads in park.*—(*a*) Drivers of vehicles of any description drawn by animals, when overtaken by other vehicles traveling at a faster rate of speed, shall, if requested to do so, turn out and give the latter free and unobstructed passageway.

(*b*) Vehicles in passing each other must each give full half of the roadway. This applies to freight outfits as well as any other, but not to automobiles or motor cycles otherwise provided for.

(*c*) Freight, baggage, and heavy camping outfits will take the outer side of the road when being passed by passenger vehicles in either direction.

(*d*) Transportation companies and all other parties and persons using the park roads will be held liable for violations of these instructions.

(*e*) Mounted men, on meeting a passenger team on a grade, will halt on the outer side until the team passes. When approaching a passenger team from the rear warning must be given, and no faster gait will be taken than is necessary to make the passage, and if on a

grade the passage will be on the outer side. A passenger team must not be passed on a dangerous grade.

11. *Miscellaneous.*—Automobiles and motor cycles are permitted in this park under special regulations prescribed by the Secretary of the Interior.

No person shall ride or drive faster than a walk over any of the Government bridges within the park. Riding or driving at night other than in cases of emergency is forbidden.

Persons with animals using trails must keep therein; leaving the trails for the purpose of making short cuts will not be permitted.

It is forbidden to wash clothing or cooking utensils, or in any other way pollute the waters of the rivers and creeks of the parks, or to bathe in any of the streams near the regularly traveled thoroughfares in the park without suitable bathing clothes.

It is forbidden to water stock directly from the river or creeks above any tourist camp. A bucket or other vessel should be used.

It is forbidden to tie stock so as to permit their entering any of the streams of the park. All animals should be kept a sufficient distance from camping grounds not to litter the ground and make unfit for use the area which may be used later as tent sites.

It is forbidden for anyone to soil or in any way write upon or mutilate any of the signs or structures erected for public convenience.

It is forbidden to take bark from any live sequoia tree on the park lands.

Campers and all others, save those holding licenses from the Secretary of the Interior, are prohibited from hiring their horses, trappings, or vehicles to tourists or visitors in the park.

All complaints by tourists and others as to service, etc., rendered in the reservation should be made to the superintendent, in writing, before the complainant leaves the park.

12. The penalty for disregard of these instructions is summary ejection from the park.

REGULATIONS OF JUNE 28, 1913, GOVERNING THE ADMISSION OF AUTOMOBILES AND MOTOR CYCLES INTO THE SEQUOIA NATIONAL PARK.

Pursuant to authority conferred by the acts of September 25 and October 1, 1890 (26 Stat., 478, 650), setting aside certain lands in the State of California as a public park, the following regulations governing the admission of automobiles and motor cycles into the Sequoia National Park are hereby established and made public:

1. No automobiles or motor cycles will be permitted within the metes and bounds of Sequoia National Park unless the owners thereof secure a written permit from the acting superintendent or his representative. Permits may be obtained from the acting superintendent at Three Rivers, Cal., or his authorized representative at Rocky Gulch Station on the Government road in the Sequoia National Park.

2. Applications for permit must show: (*a*) Name of owner, (*b*) number of machine, (*c*) name of driver, and (*d*) inclusive dates for which permit is desired, and be accompanied by a fee of $5 for a single round trip through the park.[1] Permits must be presented to the acting superintendent or his authorized representative at the Rocky

[1] Effective July 17, 1915, this paragraph amended so that fee for single round trip through the park is fixed at $2.50, and fee for season permit is fixed at $10.

Gulch Station on the Government road. The permittee will not be allowed to do a commercial or transportation business in the park without a special license therefor from the Secretary of the Interior. All permits will expire on October 1 of the year of issue.

3. The use of automobiles and motor cycles will be permitted on the Giant Forest Road, from the western boundary of the Sequoia National Park to Camp Sierra, the tourists' camp grounds, not earlier than 7 a. m., and not latter than 5.30 p. m. No automobile or motor cycle shall leave Camp Sierra in the direction of the western park boundary later than 6 p. m.

4. When teams approach, motor vehicles will take position on the outer edge of roadway, regardless of the direction in which they are going, taking care that sufficient room is left on the inside for the passage of teams.

5. Motors will stop when teams approach, and remain at rest until teams have passed or until teamsters are satisfied regarding the safety of their teams.

6. Speed will be limited to 6 miles per hour, except on straight stretches where approaching teams will be visible, when, if no teams are in sight, this speed may be increased; but in no event, however, shall it exceed 15 miles per hour.

7. Signal with horn will be given at or near every bend to announce to approaching teams the proximity of the motors.

8. Teams have the right of way, and machines will be backed or otherwise handled, as necessary, so as to enable teams to pass with safety.

9. All persons when entering the park with machines are required to stop at Rocky Gulch Station and register their names.

10. Violation of any of the foregoing rules, or the general regulations for the government of the park, will cause revocation of permit; will subject the owner of the machine to any damages occasioned thereby, and to ejectment from the reservation; and be cause for refusal to issue a new permit to the owner without prior sanction in writing from the Secretary of the Interior.

REGULATIONS OF MAY 1, 1914, GOVERNING THE ADMISSION OF AUTOMOBILES AND MOTOR CYCLES INTO THE GENERAL GRANT NATIONAL PARK.

Pursuant to authority conferred by the act of October 1, 1890 (26 Stat., 650), setting aside certain lands in the State of California as a public park, the following regulations governing the admission of automobiles into the General Grant National Park are hereby established and made public:

1. No automobile will be permitted within the metes and bounds of General Grant National Park unless the owner thereof secures a written permit from the acting superintendent or his representative. Permits may be obtained from the acting superintendent at Three Rivers, Cal., or his authorized representative at the rangers' headquarters on the Government road in the General Grant National Park.

2. Applications for permits must show: (*a*) Name of owner, (*b*) number of machine, (*c*) name of driver, and (*d*) inclusive dates for which permit is desired, not exceeding one year, and be accompanied by a fee of $1 for a single round trip through the park, or a fee of $5

for each machine per annum. Permits must be presented to the acting superintendent or his authorized representative at the rangers' headquarters on the Government road. The permittee will not be allowed to do a transportation business in the park without a special license therefor from the Secretary of the Interior. All permits granted at any time when automobiles can enter the park will expire on December 31 of the year of issue.

3. The use of automobiles will be permitted only on the Millwood Road, the North Road, and the Stephens Grade Road between the hours of 6 a. m. and 7 p. m.

4. When teams approach, automobiles will take position on the outer edge of roadway, regardless of the direction in which they are going, taking care that sufficient room is left on the inside for the passage of teams.

5. Automobiles will stop when teams approach and remain at rest until teams have passed or until teamsters are satisfied regarding the safety of their teams.

6. Speed will be limited to 6 miles per hour, except on straight stretches where approaching teams will be visible, when, if no teams are in sight, this speed may be increased to the rate indicated on signboards along the road; in no event, however, shall it exceed 15 miles per hour.

7. Signal with horn will be given at or near every bend to announce to approaching teams the proximity of an automobile.

8. Teams have the right of way, and automobiles will be backed or otherwise handled, as necessary, so as to enable teams to pass with safety.

9. Violation of any of the foregoing rules or the general regulations for the government of the park will cause revocation of permit; will subject the owner of the automobile to any damages occasioned thereby and to ejectment from the reservation, and be cause for refusal to issue a new permit to the owner without prior sanction in writing from the Secretary of the Interior.

10. All persons passing through the park with automobiles should be required to stop at the rangers' headquarters and register their names.

11. These rules are also applicable to motor cycles, which may use only the roads herein mentioned, on payment of a fee of $1 for each machine per annum; permits issued therefor shall expire on December 31 of the year of issue.

Excerpt from the act making appropriations for the sundry civil expenses of the Government for the fiscal year ending June 30, 1916, and for other purposes, approved March 3, 1915.

SEQUOIA NATIONAL PARK, CALIFORNIA: For protection and improvement, construction, and repair of bridges, fences, and trails, and improvement of roads other than toll roads, including the purchase of necessary land where and under such conditions as the Secretary of the Interior may direct, for ranger station at a cost not exceeding $500; the Secretary of the Interior is hereby authorized to accept patented lands or rights of way, whether over patented or other lands, in the Sequoia National Park that may be donated for park purposes, $15,550.

REPORT OF THE SUPERVISOR OF THE MOUNT RAINIER NATIONAL PARK.

REPORT OF THE SUPERVISOR OF THE MOUNT RAINIER NATIONAL PARK.

OFFICE OF THE SUPERVISOR,
Ashford, Wash., September 30, 1915.

SIR: I have the honor of submitting the following report of operations in Mount Rainier National Park for the season of 1915:

GENERAL STATEMENT.

Mount Rainier National Park was created by act of Congress approved March 2, 1899, and exclusive jurisdiction of the territory so set aside for national park purposes was ceded to the United States Government by act of the Legislature of the State of Washington approved March 16, 1901. The United States has not complied with the provision of said act of the Legislature of the State of Washington which reads:

Provided, however, That jurisdiction shall not vest until the United States, through the proper officer, notifies the governor of this State that they assume police or military jurisdiction over said park.

The park is located in the western part of the State of Washington immediately west of the summit of the Cascade Range of mountains and about 40 miles southeasterly from the southern end of Puget Sound.

It is situated largely in Pierce County, but a portion lies in Lewis County.

The administrative office is located at the main entrance to the park, near the southwest corner, which is distant by automobile road 93 miles from Seattle, 56 miles from Tacoma, and 6½ miles from Ashford, on the Tacoma Eastern Railroad, a branch line of the Chicago, Milwaukee & St. Paul Railway.

It is connected by telephone to Seattle, Tacoma, and the principal camps and ranger stations within the park.

The department is represented in the administration and management of the park by Mr. Stephen T. Mather, assistant to the secretary, Mr. Mark Daniels, general superintendent and landscape engineer of national parks, Monadnock Building, San Francisco, Cal., and by a local supervisor who is assisted throughout the year by a clerk-stenographer, a chief park ranger, and two permanent park rangers. During the summer months additional assistance is rendered by six temporary park rangers, a general foreman of construction, and from 50 to 150 men.

TOPOGRAPHY.

The northwest corner of the park, by road and trail travel, is about 45 miles southeast from the tidewaters of Puget Sound, an arm of the Pacific Ocean, from which waters and the country surrounding the

main object of interest in the park, Mount Rainier, appears during the prevalence of ordinary clear weather as a most imposing spectacle—an ice and snow clad dome 14,408 feet high.

The park reserve is a nearly perfect square, the sides of which are 18 miles in length, and contains, therefore, 324 square miles, or sections of 640 acres each (207,360 acres), and is completely surrounded by lands embraced within the Rainier National Forest.

Near the center of the park is the summit of Mount Rainier, from which radiates a system of glaciers, ranking in importance with any similar system or group of glaciers in the world. There are more than a score of these glaciers, from which originate four important rivers—the Nisqually, the Puyallup, the White, and the Cowlitz—the three first named having large electric-power generating plants located on them at points outside the park, but all dependent upon this glacial system and the waters originating therein. The Cowlitz is as important as the others in this respect, but as yet completed development of power-generating plants has not been accomplished.

The general elevation at the boundary lines of the park of the glacial valleys is 2,000 feet above sea level. From the boundary lines these valleys afford a comparatively easy grade to the lower ends or "snouts" of the various glaciers, approximately an average additional elevation of 2,000 feet. At these glacial snouts the real Alpine nature of Mount Rainier National Park territory is thrust upon the traveler, and from, over, around, and alongside the glaciers trails have been constructed with a view to making the wonders of nature within the park easily accessible as well as to provide patrol routes for the protection of the forests and game. These trails lead to the camps or parks known as Paradise Valley (Camp of the Clouds), Indian Henry's Hunting Ground (Wigwam Hotel), Van Trump Park, Cowlitz Park, Ohanapecosh Valley, and Silver Spray Falls, Moraine Park, Grand Park, Elysian Fields, Spray Park, Natural Bridge Cataract Basin, St. Andrews Park, Glacier Basin, etc.

There is at present but one wagon-road entrance to this vast wonderland. This road leads out from Tacoma and Seattle and is a highly improved thoroughfare for a greater part of the distance from these cities to the park entrance, near the southwest corner of the park, a distance of 56 miles from Tacoma and 93 miles from Seattle. At the park gate this road is met by the road built and maintained by the Government within the park. The Government end of this road is 20.4 miles in length, leading from the entrance gate (elevation, 2,003 feet) to Longmire Springs (6.6 miles; elevation, 2,750 feet); thence to foot of Nisqually Glacier (5.3 miles; elevation, 3,909 feet); thence to Narada Falls (4.1 miles; elevation, 4,572 feet); thence to the Camp of the Clouds in Paradise Valley (4.4 miles; elevation, 5,557 feet). To this point the road is open to automobiles during the summer months. The road above Nisqually Glacier was opened to automobiles for the first time on June 20, 1915.

FOREST CONDITIONS.

More than 200 square miles of the park lands are densely timbered. Douglas fir, white cedar, Alaska cedar, and hemlock are the predominating varieties. In addition to those named, the following varieties are found at various points within the park: Lovely fir,

Noble fir, Alpine fir, Silver fir, Alpine hemlock, spruce, white pine, black (or lodge pole) pine, alder cottonwood, quaking aspen, broad-leaf maple, vine maple, and smooth-leaf maple.

At an approximate general elevation of 4,500 feet the density of timber growth gradually diminishes until the extreme timber line is reached. The intervening areas, which are usually benches or plateaus on the long, sloping ridges separating the various glacial basins, form beautiful natural parks, in some of which tent camps or hotels are established and to which tourists resort in large numbers for rest and recreation. These natural parks and tent camps serve as bases for the arduous task of ascending to the summit of Mount Rainier, and for exploring the lesser mountain peaks, the glaciers, snow fields, and canyons so numerous within the park areas and in the areas surrounding.

These upland meadows, benches, plateaus, or natural parks are beautifully adorned by nature with flowers and shrubs of infinite variety and color and furnish to the most skilled botanist, not to speak of the amateur and the mere lover of the beautiful, problems in nature study never ending. Nearly 400 varieties of plant life are known to grow within the park.

ROADS AND TRAILS.

The Government road from the southwest corner of the park to the Camp of the Clouds in Paradise Valley was constructed under direction of the War Department. The road was opened for travel during 1910. The original cost of construction was $240,000. During the fiscal year ending June 30, 1915, $32,364.19 was expended in repairing and improving this road. During the season just ending this road has been improved at various points by widening, constructing rock and timber crib retaining walls, guardrails, and by surfacing with 6 inches of cement gravel.

Between Longmire Springs and Narada Falls the road stands up fairly well under the heavy rains, but on the reaches below Longmire Springs and above Narada Falls considerable improvement work must yet be done to put the road in passable condition during wet weather. The section above Narada Falls was closed to traffic after each heavy rain during the present season.

The road above Nisqually Glacier was opened to automobiles on June 20, 1915, and was operated throughout the season on a one-way schedule, by which automobiles left the Glacier ascending and Paradise Valley descending on each hour from 7 a. m. to 7 p. m., passing at Narada Falls on the half hour. This traffic was controlled by three traffic officers, in telephone communication, stationed at Nisqually Glacier, Narada Falls, and Paradise Valley. The system met with universal satisfaction from the public, and it is believed that the necessary expenditure to improve this road for two-way traffic is not justified.

During the season of 1915 over 5,000 automobiles and 30,000 people passed over this road without an accident of any kind.

The original wooden bridge over Tahoma Creek, 1.2 miles from the park entrance, was replaced by a reinforced concrete structure of two 30-foot spans by McHugh & Creelman, Tacoma, Wash., contract price, $2,365.

The park trail system now has a total length of 150 miles. During the months of May, June, and July of this season three trail construction crews of 15 men each were engaged in trail building—completing about August 1 the east and west side connections of the trail encircling system. This work was done at an average cost of about $300 per mile.

The Mountaineers, about 90 in number, with a pack train of 50 horses, made the circuit of the mountain in August. The trip around the mountain can be made in about seven days, with an average march of 20 miles over the trail. This trip with proper advertising should become a very popular feature of the park. By making camp each night at certain designated points in the natural parks and upland meadows, the tourist can travel on foot by the shortest route, between camps, keeping above timber line, and obtain a magnificent view of the mountain and surrounding country from all angles, affording one of the most interesting scenic trips in all the world.

BUILDINGS.

There are eight ranger cabins in the park. The cabin at the main park entrance on the Government road, near the southwest corner of the park, is used as a general office for the park service and as living quarters for the clerk-stenographer and temporary ranger at that station. The main building (two rooms) is constructed of cedar logs. Frame additions for office purposes and kitchen have been added. The supervisor also uses this building as living quarters during the winter months.

At Longmire Springs the four-room pine-log cabin with frame addition for kitchen has been taken as a residence for the supervisor, and an old building near by, formerly used as an office by the Engineer Corps of the United States Army, has been cleaned and repaired to serve as quarters for the permanent ranger at Longmire station.

The Paradise Valley, Carbon River, and Ohanapecosh ranger stations are provided with one-room log buildings, and two more, located at Indian Henry's and White River stations, are being constructed this season.

Two small frame buildings, 10 by 12, have been constructed this season at Nisqually Glacier and Narada Falls for use by the traffic officers.

A frame warehouse is located at Longmire station, and park-service tools, equipment, and supplies are assembled therein at such times as service conditions will allow.

TELEPHONES.

During the present season 40 miles of single-wire telephone line has been constructed over the west side trail from a point on South Fork of the Puyallup River via Sunset Park, Mountain Meadows, Crater Lake, Spray Park, Carbon River Valley to the Carbon River ranger station and the northwest corner of the park, from which point the Forest Service has extended the line to a connection with the commercial line at Fairfax, Wash.

An additional 20 miles is now under construction from Glacier Cabin at the snout of the Carbon Glacier via Mystic Lake, Glacier

Basin, and the White River Valley to the ranger station on White River at boundary post No. 62. When completed these extensions will bring the total mileage of single-wire Government line within the park up to 90 miles.

In addition there is 6.6 miles of telephone, belonging to the Tacoma Eastern Railroad Co., which terminates at Longmire Springs.

MINING CLAIMS.

Mining operations are confined to claims located prior to the act of Congress of May 27, 1908, prohibiting the location of mineral claims within the park.

Active claim is asserted to nine locations by the Mount Rainier Mining Co. in the Glacier Basin district (north central section of the park), while in the vicinity of Longmire Springs (south central section) the Eagle Peak Copper Mining Co. is working toward the development of two claims, and Sherman Evans and Ike Evans two claims. Improvements on all of these claims consist largely of tunnels. No ore shipments have ever been made except for test purposes, from any mine within the park, though operations of various kinds have been in progress for nearly 20 years.

FIRES.

No fires occurred within the park during the season of 1915. During the month there were numerous fires outside the park and for about one week in the latter part of the month the smoke drifted into the park to such an extent that sight-seeing was impossible except in the early morning hours.

PATROL.

During the season there were employed in the park service nine park rangers: Thomas E. O'Farrell, chief park ranger, stationed on the Carbon River at the northwest corner of the park, from which point he directed the patrol, trail, and telephone construction work on the north side; Prof. J. B. Flett, park ranger, stationed at Longmire Springs in charge of traffic, camp grounds, and the distribution of park literature, general information concerning the flora, trees, shrubbery, etc.; Rudolph L. Rosso, park ranger, stationed at Paradise Valley, in charge of Paradise Valley and Indian Henry's Camps; Arthur White, temporary park ranger, stationed on White River in the northeast corner of the park; Herman B. Burnett, temporary park ranger, stationed at the Ohanapecosh Hot Springs in the southeast corner of the park; Earl V. Clifford, temporary park ranger, stationed at the park entrance, in charge of the registration of visitors and issuing automobile permits; Archibald Duncan, L. D. Boyle, and M. D. Gunston, temporary park rangers, stationed at Nisqually Glacier, Narada Falls, and Paradise Valley, respectively, as traffic officers, under the supervision of Chas. A. Clark, general foreman of road improvement work.

GAME.

The comparatively mild winter of 1914–15 was very favorable to game increase, and, judged from the frequency of being encountered by tourists and park rangers, there has been a very satisfactory increase of deer. Hunting is absolutely prohibited in park territory, and every precaution is taken by park officers to prevent poaching, but the densely wooded nature of park territory makes it impossible to entirely stop the practice. A great many goats have been observed at various times and places during the past summer. One band of 100 goats was observed by trail workers in August. A number of goats have pastured in Van Trump Park this season.

MINERAL SPRINGS.

The mineral springs at Longmire constitute an attraction which has had much to do with the development of the park. The ground on which these springs are located was patented under the mining laws a number of years ago and is held by private parties. This tract is so situated with reference to Government lands that the public can not readily distinguish the private from the public lands and buildings. Several kinds of mineralized waters spring from the ground on this tract and little care is exercised to prevent pollution. A large amount of this water has a temperature of 70° F. on reaching the surface. It is heavily charged with sulphur, and a swimming tank is provided in order that visitors may take a "sulphur plunge." Other waters are charged with iron, and still others are sweet, cool and sparkling.

Immediately south of the southern boundary of the park, near the southeast corner, very hot mineral springs are located, and an attempt is being made to acquire them under the mineral-land laws. If this attempt fails, the small amount of land involved should be taken from the national forest and added to the park.

Fine mineralized water has been discovered on the new trail, which was built up the Tahoma Fork River, 5 miles north of the Government road and also on the South Fork of Puyallup River near boundary post No. 16.

TRAVEL.

During the season 32,764 visitors to the park registered at the park office, on the Government road, near the southwest corner of the park. There is no systematic effort to obtain registration of entrances at other places on the boundaries, but the ranger in the Carbon River district estimates the number of entrances on the north side as being 2,000, and the ranger at Ohanapecosh station estimates the number entering there at 50, making the number of visitors reach the total of 34,814, as compared to a total of 15,038 for the season of 1914. A systematic count of the park gate registration shows the 32,764 registrations at that point to be distributed as follows: From Tacoma, 8,194; from Seattle, 7,437; from other points in the State of Washington, 5,544; from points outside the State of Washington, 11,589.

The number of private automobile permits issued during the season of 1915 was 3,230, as compared to 1,594 issued in 1914. The number

of people entering in private automobiles was 23,404; the total number of machine entrances, 5,029. The figures given in the last sentence above do not include the automobile-stage entrances, by which means 8,153 people entered, 3,652 having come to Ashford, on the Tacoma Eastern Railroad, thence to the park in automobile stage, the remaining 4,501 having come on automobile stages from Tacoma; 200 people entered in horse-drawn vehicles; 5,000 people came into the park for camping purposes. The average length of time each person remained in the park is estimated at three days. Visitors are not required to register on going out.

AUTOMOBILES AND MOTORCYCLES.

During the year ended September 30, 1915, there were issued 3,230 permits to owners of private automobiles to use the roads of the park for travel. These permits are good for repeated entrances until December 31 of the year of issue. For each of these permits a fee of $5 was exacted, making the revenue collections from this source $16,150, while public automobiles paid $1,900. Motorcycles to the number of 247 were licensed at $1 each.

ACCIDENTS.

Two fatal accidents occurred in the park during the month of August, 1915. On August 19 Mr. Gilbert Francis Ordway, a prominent attorney of Boston, Mass., while returning from the summit of Mount Rainier, was killed near Gibraltar in descending the cliffs of Cowlitz Cleaver, a rocky ridge that extends from Camp Muir to Gibraltar. The mountain-climbing party was composed of seven people and a guide. After walking along this cleaver for about a quarter of a mile the party started to leave it and go down to the trail in the snow below. When within 15 feet of the trail Mr. Ordway placed his Alpine staff directly in front of him, in order to make a step down of about 2 feet. Suddenly his staff slipped, precipitating him forward to the trail below, a drop of about 15 feet. He struck on his head, just back of the left ear, against a rock, rendering him unconscious, in which state he remained until his death. The accident happened at 4.20 p. m., but he lived until the rescue party reached him at 10 p. m.

On August 31 Mr. C. W. Ferguson, of Seattle, Wash., was killed by falling ice in the caves of Paradise Glacier. There were 17 people and a guide in the party. Disregarding the instructions of the guide, several people proceeded in advance and entered the caves. Two boys passed through, Mr. Ferguson, accompanied by his wife, followed, stopped inside and began picking at the ice overhead with his Alpine staff, when a large block of ice broke loose, killing him instantly.

Aside from these two no other accidents have occurred.

An arrangement was made with Dr. James R. Yocom, of Tacoma, for medical and hospital service to the men employed on construction work, for which the men contributed $1 per month. Two patients were removed to the hospital in Tacoma, one of whom died.

CONCESSIONS AND SPECIAL PERMITS.

Following is a list of special permits issued and amounts paid therefor for the season now closing:

Special permits issued during season of 1915.

HOTELS AND TENT CAMPS.

Tacoma Eastern Railroad, hotel at Longmire Springs (see also Telephones)	$500.00
John L. Reese, tent camp in Paradise Valley (see also Novelty sales stands)	577.50
George B. Hall, tent camp in Indian Henry's Hunting Grounds (see also Livery barns and pony trains)	75.00

LIVERY BARNS AND PONY TRAINS.

Tacoma Taxicab & Baggage Transfer Co (see also Automobiles)	65.00
George B. Hall (see also Hotels and tent camps)	200.00

NOVELTY SALES STANDS.

National Park Hotel & Transportation Co., in lobby of National Park Inn, Longmire Springs	50.00
John L. Reese, at camp Paradise Park (see also Hotels and tent camps)	15.00

GUIDES.

Harry G. Greer	25.00
Jules Stampfler	25.00
H. A. Loss	20.00
R. E. Williams (packer, 1 horse)	1.00

AUTOMOBILES AND MOTORCYCLES.

Tacoma Taxicab & Baggage Transfer Co., five 12-passenger automobiles and two 20-passenger automobiles for hire (see also Livery barns and pony trains)	400.00
Mountain Transportation Co., four 12-passenger automobiles for hire	200.00
Atherton's Bluebird Tours Co., three 7-passenger automobiles and two 24-passenger automobiles for hire	300.00
Tacoma Auto Livery Co., five 7-passenger automobiles for hire	250.00
Pacific Auto Transit Co., two 16-passenger automobiles for hire	150.00
Mount Tacoma-Rainier Tours Co., two 7-passenger automobiles for hire	100.00
Independent Touring Car Co., two 7-passenger automobiles for hire	100.00
Burgon D. Mesler, one 5-passenger automobile for hire	50.00
J. G. McCormick, one 7-passenger automobile for hire	50.00
Conrad M. Hansen, one 7-passenger automobile for hire	50.00
W. P. Geisenheyner, one 7-passenger automobile for hire	50.00
D. J. Lindsay, one 7-passenger automobile for hire	50.00
Frank Gill, one 7-passenger automobile for hire	50.00
Edwin L. Davis, one 7-passenger automobile for hire	50.00
R. H. Chantler, one 7-passenger automobile for hire	50.00
Private automobiles, 3,230, at $5 each	16,150.00
Motorcycles, 247, at $1 each	247.00

TELEPHONES.

Tacoma Eastern Railroad (see also Hotels and tent camps)	25.00

PHOTOGRAPHERS.

L. G. Linkletter	50.00
E. Ray Hackett	75.00

MISCELLANEOUS.

Elcaine Longmire, ice cream, confectionery, and camp grocery	$100.00
James G. Patterson, barber shop in Reese's camp	5.00
Mount Rainier Mining Co., privileges on abandoned mining claims	300.00
Mount Rainier Mining Co., for timber cut in park	200.00
Eagle Peak Copper Mining Co., for use of water in Paradise River for generating electricity	7.50
National Park Hotel & Transportation Co., fuel wood	10.00
John L. Reese, fuel wood	20.00
Thos. B. Elliott, ice cream, soft drink, and lunch stand near foot of Nisqually Glacier	25.00
William Nish, telescopes for view purposes	25.00
Tacoma Taxicab & Baggage Transfer Co., temporary garage in Paradise Valley	50.00
National Park Inn, fuel wood	3.00
Total revenues	20,746.00

HOTELS AND CAMP ACCOMMODATIONS.

The National Park Inn, at Longmire Springs, is the principal public stopping place within the park. The franchise to operate this hotel is held in the name of the Tacoma Eastern Railroad. The building is a frame structure, two and one-half stories in height, 125 feet long, and 32 feet wide. There are 36 guest rooms in the main building, and through the use of tents 250 guests may be accommodated. A very attractive clubhouse or assembly hall, built of pine logs, has been provided for the comfort and enjoyment of guests. Water is taken from the Nisqually River for the operation of an electric lighting and refrigerating plant.

A hotel and tent camp is operated on the patented lands at Longmire Springs by Mrs. Elcaine Longmire.

John L. Reese operates a tent camp in Paradise Valley, and George B. Hall operates a tent camp in Indian Henry's Hunting Grounds.

Very respectfully,

D. L. REABURN,
Supervisor.

The SECRETARY OF THE INTERIOR.

APPENDIX.

RULES AND REGULATIONS.

General regulations of March 30, 1912.

Pursuant to the authority conferred by the acts of Congress approved March 2, 1899, and May 27, 1908, the following rules and regulations for the government of the Mount Rainier National Park, in the State of Washington, are hereby established and made public:

1. It is forbidden to injure or disturb in any manner any of the mineral deposits, natural curiosities, or wonders on the Government lands within the park.

2. It is forbidden to cut or injure any timber growing on the park lands, or to deface or injure any Government property. Camping parties will be allowed to use dead or fallen timber for fuel.

3. Fires should be lighted only when necessary and completely extinguished when not longer required. The utmost care must be exercised at all times to avoid setting fire to the timber and grass.

4. Hunting or killing, wounding, or capturing any bird or wild animal on the park lands, except dangerous animals when necessary to prevent them from destroying life or inflicting an injury, is prohibited. The outfits, including guns, traps, teams, horses, or means of transportation used by persons engaged in hunting, killing, trapping, ensnaring, or capturing such birds or wild animals, or in possession of game killed on the park lands under other circumstances than prescribed above, will be taken up by the superintendent and held subject to the order of the Secretary of the Interior, except in cases where it is shown by satisfactory evidence that the outfit is not the property of the person or persons violating this regulation and the actual owner thereof was not a party to such violation. Firearms will only be permitted in the park on written permission from the superintendent thereof.

5. Fishing with nets, seines, traps, or by the use of drugs or explosives, or in any other way than with hook and line, is prohibited. Fishing for purposes of merchandise or profit is forbidden. Fishing may be prohibited by order of the superintendent in any of the waters of the park, or limited therein to any specified season of the year, until otherwise ordered by the Secretary of the Interior.

6. No person will be permitted to reside permanently, engage in any business, or erect buildings, etc., upon the Government lands in the park without permission, in writing, from the Secretary of the Interior. The superintendent may grant authority to competent persons to act as guides and revoke the same in his discretion. No pack trains will be allowed in the park unless in charge of a duly registered guide.

7. Owners of patented lands within the park limits are entitled to the full use and enjoyment thereof; the boundaries of such lands,

however, must be determined, and marked and defined, so that they may be readily distinguished from the park lands. While no limitations or conditions are imposed upon the use of such private lands so long as such use does not interfere with or injure the park, private owners must provide against trespass by their stock or cattle, or otherwise, upon the park lands, and all trespasses committed will be punished to the full extent of the law. Stock may be taken over the park lands to patented private lands with the written permission and under the supervision of the superintendent, but such permission and supervision are not required when access to such private lands is had wholly over roads or lands not owned or controlled by the United States.

8. Hereafter the location of mining claims under the mineral-land laws of the United States is prohibited within the park. Persons who have heretofore acquired in good faith rights to any mining location or locations shall not be permitted to injure, destroy, or interfere with the retention in their natural condition of any timber, mineral deposits, natural curiosities, or wonders within said park outside the boundaries of their respective mining claims duly located and held under the mineral-land laws.

9. Allowing the running at large, herding, or grazing of cattle or stock of any kind on the Government lands in the park, as well as the driving of such stock or cattle over same, is strictly forbidden, except where authority therefor has been granted by the superintendent. All cattle or stock found trespassing on the park lands will be impounded and disposed of as directed in regulations approved March 30, 1912.

10. No drinking saloon or barroom will be permitted upon Government lands in the park.

11. Private notices or advertisements shall not be posted or displayed on the Government lands within the reservation, except such as may be necessary for the convenience and guidance of the public.

12. Persons who render themselves obnoxious by disorderly conduct or bad behavior, or who violate any of the foregoing rules will be summarily removed from the park and will not be allowed to return without permission, in writing, from the Secretary of the Interior or the superintendent of the park.

No lessee or licensee shall retain in his employ any person whose presence in the park shall be deemed and declared by the superintendent to be subversive of the good order and management of the reservation.

13. The superintendent designated by the Secretary is hereby authorized and directed to remove all trespassers from the Government lands in the park and enforce these rules and regulations and all the provisions of the acts of Congress aforesaid.

Instructions of May 2, 1914.

1. Interference with, or molestation of, any bear or other wild animal in the park in any way by any person not authorized by the superintendent is prohibited.

2. The wanton destruction of wild flowers, plants, or shrubs growing on the park lands is forbidden.

3. *Fires.*—The greatest care must be exercised to insure the complete extinction of all camp fires before they are abandoned. All ashes and unburned bits of wood must, when practicable, be thoroughly soaked with water. Where fires are built in the neighborhood of decayed logs, particular attention must be directed to the extinguishment of fires in the decaying mold. Fire may be extinguished where water is not available by a complete covering of earth, free from twigs or other vegetable matter, and well packed down. Care should be taken that no lighted match, cigar, or cigarette is dropped in any grass, twigs, leaves, or tree mold.

All fires found which have not been properly safeguarded should be reported to some official of the park service. Fires should be lighted only when necessary, and it is insisted that such fires be completely extinguished when no longer required. Fires must not be kept burning during night or day unless some one is left in charge.

4. *Camps.*—No camp will be made except at designated localities. All campers in Paradise Valley shall first report to the superintendent or his authorized representative for assignment to camping sites, and will not change camps without permission. Blankets, clothing, hammocks, or any other article liable to frighten teams must not be hung near the road. The same rule applies to temporary stops, such as for feeding horses or for taking lunch.

5. *Rubbish.*—Many successive parties camp on the same sites during the season, and camp grounds must be thoroughly cleaned before they are abandoned. Lunch boxes, paper, and other refuse must not be scattered along trails, roads, and at other places in the park; tin cans must be flattened, and, with bottles, cast-off clothing, and all other débris, must be deposited in a pit provided for the purpose. When camps are made in unusual places where pits may not be provided, all refuse must be hidden where it will not be offensive to the eye.

6. *Bicycles.*—The greatest care must be exercised by persons using bicycles or motor cycles. On meeting a team the rider must stop and stand at side of road between the bicycle or motor cycle and the team—the outer side of the road if on a grade or curve. In passing a team from the rear, the rider should learn from the driver if his horses are liable to frighten, in which case the driver should halt and the rider dismount and walk past, keeping between the bicycle or motor cycle and the team.

7. *Fishing.*—All fish less than 8 inches in length should at once be returned to the water with the least damage possible to the fish. Fish that are to be retained must be at once killed by a blow on the back of the head or by thrusting a knife or other sharp instrument into the head. No one person shall catch more than 20 fish in one day.

Compliance with the fishing laws of the State of Washington will be required by park officers.

8. *Dogs and cats.*—Dogs and cats are not permitted on the park lands. This rule, so far as it relates to dogs, does not apply to dogs trained for use by Government employees in the extermination of predatory wild animals.

9. *Stages.*—Stages arriving at Longmire Springs and Paradise Valley shall stop at each hotel or permanent camp in the order of location, so that passengers may exercise the right of selection.

10. *Driving on roads of park.*—(*a*) Drivers of vehicles of any description, when overtaken by other vehicles traveling at a faster rate

of speed and within the prescribed speed limits, shall, if requested to do so, turn out and give the latter free and unobstructed passageway.

(*b*) Vehicles, in passing each other, must give full half of the roadway. This applies to freight outfits as well as any other.

(*c*) Freight, baggage, and heavy camping outfits on sidehill grades throughout the park will take the outer side of the road while being passed by passenger vehicles in either direction.

(*d*) Transportation companies, freight and wood contractors, and all other parties and persons using the park roads, will be held liable for violations of these instructions.

(*e*) Mounted men on meeting a passenger team on a grade will halt on the outer side until the team passes. When approaching a passenger team from the rear warning must be given, and no faster gait will be taken than is necessary to make the passage, and if on a grade the passage will be on the outer side. A passenger team must not be passed on a dangerous grade.

(*f*) All wagons used in hauling heavy freight over the park roads must have tires not less than 4 inches in width. This order does not apply to express freight hauled in light spring wagons with single teams.

(*g*) Pack trains will be required to follow trails whenever practicable.

11. *Miscellaneous.*—No person shall ride or drive faster than a walk over any of the Government bridges within the park. Riding or driving at night is forbidden except in cases of emergency.

Persons with animals using trails must keep therein; leaving the trails for the purpose of making short cuts will not be permitted.

Persons are not allowed to bathe near any of the regularly traveled roads in the park without suitable bathing clothes.

It is forbidden to bathe, wash clothes, or cooking utensils, or in any other way pollute the waters of the rivers or creeks above the hotels in the park.

It is forbidden to water stock directly from the rivers or creeks above the hotels in the park. A bucket or other vessel should be used.

It is forbidden to tie stock within 100 yards of any tent or tent ground. It is forbidden to tie stock so near the rivers or creeks above the hotels that the stock may enter these streams.

Campers and all others, save those holding license from the Secretary of the Interior, are prohibited from hiring their horses, trappings, or vehicles to tourists or visitors in the park.

Photographers operating moving-picture cameras must report to the office of the superintendent of the park and obtain written consent, approved by the Secretary of the Interior, before they will be allowed to enter the park with their cameras. To avoid inevitable delay, applications for privileges of this character should be made at least a week in advance. Photographers operating ordinary cameras will not be allowed to sell their product in the park without a license being first obtained.

All complaints by tourists and others as to service, etc., rendered in the reservation should be made to the superintendent in writing before the complainant leaves the park.

12. The penalty for disregard of these instructions is summary ejection from the park.

Regulations of March 30, 1912, governing the impounding and disposition of loose live stock.

Horses, cattle, or other domestic live stock running at large or being herded or grazed in the Mount Rainier National Park without authority from the Secretary of the Interior will be taken up and impounded by the superintendent, who will at once give notice thereof to the owner, if known. If the owner is not known, notice of such impounding, giving a description of the animal or animals, with the brands thereon, will be posted in six public places inside the park and in two public places outside the park. Any owner of an animal thus impounded may at any time before the sale thereof reclaim the same upon proving ownership and paying the cost of notice and all expenses incident to the taking up and detention of such animal, including the cost of feeding and caring for the same. If any animal thus impounded shall not be reclaimed within 30 days from notice to the owner or from the date of posting notices, it shall be sold at public auction at such time and place as may be fixed by the superintendent after 10 days' notice, to be given by posting notices in six public places in the park and two public places outside the park, and by mailing to the owner, if known, a copy thereof.

All money received from the sale of such animals and remaining after the payment of all expenses incident to the taking up, impounding, and selling thereof, shall be carefully retained by the superintendent in a separate fund for a period of six months, during which time the net proceeds from the sale of any animal may be claimed by and paid to the owner upon the presentation of satisfactory proof of ownership, and if not so claimed within six months from the date of sale such proceeds shall be turned into the Mount Rainier National Park fund.

The superintendent shall keep a record in which shall be set down a description of all animals impounded, giving the brands found on them, the date and locality of the taking up, the date of all notices and manner in which they were given, the date of sale, the name and address of the purchaser, the amount for which each animal was sold and the cost incurred in connection therewith, and the disposition of the proceeds.

The superintendent will in each instance make every reasonable effort to ascertain the owner of the animals impounded and to give actual notice thereof to such owner.

Regulations of April 21, 1915, governing the admission of automobiles and motor cycles.

Pursuant to authority conferred by the act of March 2, 1899 (30 Stat., 993), setting aside certain lands in the State of Washington as a public park, the following regulations governing the admission of automobiles and motor cycles into the Mount Rainier National Park are hereby established and made public:

1. No automobile or motor cycle will be permitted within the metes and bounds of the Mount Rainier National Park unless the owner

thereof secures a written permit from the supervisor of the park at Ashford, Wash., or his representative.

2. Applications for permits must show: (*a*) Name of owner, (*b*) number of machine, (*c*) name of driver, and (*d*) inclusive dates for which permit is desired, not exceeding one year, and be accompanied by a fee of $5 for each automobile and $1 for each motor cycle.

Permits must be presented to the supervisor or his authorized representatives at the park entrance on the Government road. The permittee will not be allowed to do a transportation business in the park without a special license therefor from the Secretary of the Interior.

3. The use of automobiles and motor cycles will be permitted on the Government road from the western boundary of Mount Rainier National Park to Longmire Springs between the hours of 6 a. m. and 9 p. m., but no automobile or motor cycle shall enter the park, or leave Longmire Springs in the direction of the western boundary later than 8.30 p. m.; the use of automobiles and motor cycles will be permitted on the Government road between Longmire Springs and Paradise Valley between the hours of 6 a. m. and 9.30 p. m., but no automobile or motor cycle shall leave Longmire Springs in the direction of Paradise Valley later than 7.30 p. m., or leave Paradise Valley in the direction of Longmire Springs before 6 a. m., or later than 7.30 p. m.

4. When teams, saddle horses, or pack trains approach, automobiles and motor cycles will take position on the outer edge of the roadway, regardless of the direction in which they are going, taking care that sufficient room is left on the inside for horses to pass.

5. Automobiles and motor cycles will stop when teams, saddle horses, or pack trains approach, and remain at rest until they have passed or until the drivers are satisfied regarding the safety of their horses.

6. Speed will be limited to 6 miles per hour, except on straight stretches where approaching teams, saddle horses, and pack trains will be visible, when, if none are in sight, this speed may be increased to the rate indicated on signboards along the road; in no event, however, shall it exceed 15 miles per hour.

7. Signals with horn will be given at or near every bend to announce to approaching drivers the proximity of a machine.

8. Horses have the right of way, and automobiles and motor cycles will be backed or otherwise handled, as necessary, so as to enable horses to pass with safety.

9. All permits granted at any time when automobiles or motor cycles can enter the park will expire on December 31 of the year of issue.

10. Violation of any of the foregoing rules, or the general regulations for the government of the park, will cause the revocation of permit; will subject the owner of the automobile or motor cycle to any damages occasioned thereby and to ejectment from the reservation, and be cause for refusal to issue a new permit to the owner without prior sanction in writing from the Secretary of the Interior.

11. All automobile and motor cycle regulations heretofore issued are canceled and revoked.

EXCERPT FROM AN ACT ENTITLED "AN ACT TO PROVIDE FOR DETERMINING THE HEIRS OF DECEASED INDIANS, FOR THE DISPOSITION AND SALE OF ALLOTMENTS OF DECEASED INDIANS, FOR THE LEASING OF ALLOTMENTS, AND FOR OTHER PURPOSES," APPROVED JUNE 25, 1910 (36 STAT., 857), PROVIDING PUNISHMENT FOR DEPREDATIONS AND FOR NOT EXTINGUISHING FIRES ON PUBLIC LANDS, ETC.

SEC. 6. That section 50 of the act entitled "An act to codify, revise, and amend the penal laws of the United States," approved March 4, 1909 (Thirty-fifth United States Statutes at Large, page one thousand and ninety-eight), is hereby amended so as to read:

"SEC. 50. Whoever shall unlawfully cut, or aid in unlawfully cutting, or shall wantonly injure or destroy, or procure to be wantonly injured or destroyed, any tree, growing, standing, or being upon any land of the United States which, in pursuance of law, has been reserved or purchased by the United States for any public use, or upon any Indian reservation, or lands belonging to or occupied by any tribe of Indians under the authority of the United States, or any Indian allotment while the title to the same shall be held in trust by the Government, or while the same shall remain inalienable by the allottee without the consent of the United States, shall be fined not more than $500 or imprisonment not more than one year, or both."

That section 53 of said act is hereby amended so as to read:

"SEC. 53. Whoever shall build a fire in or near any forest, timber, or other inflammable material upon the public domain, or upon any Indian reservation, or lands belonging to or occupied by any tribe of Indians under the authority of the United States, or upon any Indian allotment while the title to the same shall be held in trust by the Government, or while the same shall remain inalienable by the allottee without the consent of the United States, shall, before leaving said fire, totally extinguish the same; and whoever shall fail to do so shall be fined not more than $1,000 or imprisoned not more than one year, or both."

REPORT OF THE SUPERINTENDENT OF THE MESA VERDE NATIONAL PARK.

REPORT OF THE SUPERINTENDENT OF THE MESA VERDE NATIONAL PARK.

MANCOS, COLO., *September 20, 1915.*

SIR: I have the honor to submit the following report on the management of the Mesa Verde National Park for the year ending June 30, 1915:

GENERAL STATEMENT.

The park was established by the act of June 29, 1906 (34 Stat., 616). It is situated in the extreme southwestern portion of Colorado, in Montezuma County, and embraces an area of 66.2 square miles, or 42,376 acres, but by the act of Congress approved June 30, 1913, the boundaries of the park were so changed as to include an aggregate area of 76.51 square miles, or 48,966.4 acres.

The park is under the direct control of the Secretary of the Interior, who is empowered by law to prescribe rules and regulations for its government.

CHARACTER OF THE COUNTRY.

Mesa Verde is a high table-land, dividing the Mancos and Montezuma Valleys. This mesa is elevated above the valleys some 2,000 feet, and rises abruptly from their floors, with precipitous sides, like the walls of a canyon. The northern extremity of this great mesa terminates in Point Lookout, which juts out between the two valleys, a landmark for miles in all directions. The surface of this table-land is broken by innumerable canyons, which start from the very edge of the mesa on the northern and western sides, and, growing deeper and more rugged as they descend, finally open out into the Mancos Canyon. These canyons have many great caverns in their side walls, with the overhanging rock for roofs, and in these caverns are found the ruins of the cliff dwellings. The principal ruins are found in Navajo, Cliff, Soda, Long, and Rock Canyons, though there are hundreds of lesser ruins in all the canyons in the park. Spruce Tree House is in Spruce Canyon, a branch of Navajo; Cliff Palace is in Cliff Canyon; Balcony House is in Soda; Peabody House and Inaccessible are in Navajo; Long House is in Rock Canyon; and a recently discovered ruin is in Long. These ruined houses, or villages, are found in the recesses of the canyon walls and, protected from the weather, are remarkably well preserved. Some of them are small, with only a few rooms, while others are large and must have accommodated a large population. The ruins found on the mesas, without the protection of the overhanging cliffs, have not withstood the ravages of time and are now but mounds of stone and earth.

Park Point, near the northern boundary of the park, is the highest point, with an altitude of 8,574 feet.

CUSTODIANSHIP.

The custody of the park is delegated by the Secretary of the Interior to a superintendent, whose office is maintained at Mancos, Colo., the nearest railroad point to the park. The superintendent is assisted by a limited number of rangers, whose duty it is to act as guides through the ruins and to police the park.

The best of order has been maintained within the park, and the ruins have been protected from vandalism; in fact, no attempts have been made to evade the rules and regulations.

STOCK.

It has been the custom for the department to lease the grazing lands to owners of patented lands within the park, and at present there are three leases or permits for the grazing of 1,335 head of cattle. The lessees are required to assist in maintaining order and to guard against fires within the park.

ROADS AND TRAILS.

All the roads in the park have been worked, and in most cases widened and improved. A short section of the old road, known as the Decker Road, has been abandoned, on account of the steep grade and rocky roadbed, and a new piece of road constructed which maintains an easy grade and a smooth roadbed. The road from Spruce Tree Camp to Cliff Palace, Balcony House, and Peabody House, heretofore only cleaned of brush and trees, has been widened, plowed, and graded.

WATER SUPPLY.

The water in all the wells has held out, and two new reservoirs have been constructed for stock use by the lessees of the grazing lands. The supply at Spruce Tree Camp never varies, and the engine and pump furnish an abundant supply of pure water at the camp and for the camping parties. The spring at Balcony House is always the same, a pool of clear, cold water, with no visible inlet or outlet, but always there to refresh the thirsty traveler.

BUILDINGS.

No new buildings have been erected, although the department has authorized the building of a ranger station at Spruce Tree Camp, where a man has to be stationed all the time. This building will be erected some time during the present season.

GAME.

Deer are more and more numerous each year now that they are unmolested. Small game is plentiful, and the rabbit is everywhere. Coyotes, too, are numerous.

TRAVEL.

The number of tourists registering at Spruce Tree Camp during the year ended June 30, 1915, was 663, a gain of over a hundred, and this does not show the real gain, for the season was late opening and tourist travel did not commence until the year had closed.

REPAIRS TO THE RUINS.

During the year no repairs to the ruins were undertaken other than replacing ladders or repairing the trails leading to the ruins. A ruin in Long Canyon was entered by one of the rangers for the first time since it was abandoned by its original tenants. Its difficult approach had protected it from all vandalism, and it was found just as it had been left, no one knows how long ago. One sealed room contained a fine collection of jars and implements. It was reached by swinging a ladder over the cliff, anchoring it at the top, and letting it swing. Down this swinging ladder the ranger went and then anchored it at the bottom. Now tourists make the descent.

TELEPHONE LINE.

A telephone line has been constructed from Mancos to Spruce Tree Camp with five road boxes along the road, and now tourists are not beyond the use of the long-distance telephone. The boxes along the road are for the convenience of the traveler, and connect with the Mancos exchange of the Mountain States Telephone & Telegraph Co.

AUTOMOBILES.

Automobiles and motorcycles are allowed to make the run to the ruins, and many machines have been permitted within the park. The run is made in about three hours.

MINING.

The mine operated by George S. Todd, of Cortez, Colo., has produced 474 tons and 1,281 pounds of coal during the year ended June 30, 1915. Tnis is the only mine now operated within the boundaries of Mesa Verde National Park.

LANDS.

There are 720 acres of patented lands within the park, and these lands should be acquired by the Government at as early a date as possible, especially the four claims that lie on the mesa, in the heart of the park—the two Prater claims, the Armstrong claim, and the Waters claim. The following are the patented lands:

Patented land in Mesa Verde National Park.

	Acres.
H. E. 915, made Feb. 20, 1900, by Albert Prater, for SE. ¼ SE. ¼ sec. 18, E. ½ NE. ¼, NE. ¼ SE. ¼, sec. 19, patented Nov. 14, 1915	160
H. E. 0989, made Mar. 19, 1900, by Mabyn Morefield (now Armstrong), for E. ½ NW. ¼, E. ½ SW. ¼, sec. 20, patented Aug. 25, 1910	160

	Acres.
C. E. 339, made Apr. 10, 1889, by Frederick Richards, for NE. ¼ SW. ¼ sec. 26, patented July 14, 1891	40
C. E. 395, made Oct. 15, 1889, by George M. Comfort, for NE. ¼ NW. ¼ sec. 26, patented July 14, 1891	40
H. E. 0354, made Sept. 11, 1903, by Ellen Elizabeth Waters, for W. ½ SE. ¼ and W. ½ NE. ¼ sec. 28, patented May 15, 1911	160
H. E. 1021, made Feb. 16, 1900, by William F. Prater, for SE. ¼ SE. ¼ sec. 19 and E. ½ NE. ¼, NE. ¼ SE. ¼, sec. 30, patented Aug. 10, 1906	160
Total	720

(All in T. 35 N., R. 14 W., New Mexico principal meridian.)

RECOMMENDATIONS.

Road building.—A new road should be constructed to make the ascent of the mesa, and the road from the northern boundary of the park to station 64 should be abandoned, as this is the most expensive portion of the road to maintain and is the only part where there can be any danger to travelers. The old road, now in use, is narrow, and is directly under the overhanging cliffs of Point Lookout, where every shower brings down rock and earth, causing great expense in repairs. The proposed road would ascend the mesa on the east of Point Lookout and pass through a scrub-oak country with nothing to threaten overhead. The heavy growth of oak holds the earth, and a cut through such ground does not slide in or fill from wash of rains. The distance would be approximately 8 miles, and would join the Mills survey at station 64. One-fourth mile beyond this point the road should ascend the divide between Morefield and Prater Canyons, and strike the Mills survey at a point near station 167. The estimated cost of the 8 miles of road is $600 per mile, an aggregate of $4,800. A new road should be constructed from near the head of Navajo Canyon, on the line of the present road, to Rock Springs, and the many interesting ruins in that vicinity, a distance of approximately 12 miles, and at an estimated cost of $350 per mile, an aggregate of $4,200. With $300 for widening a short distance of the Decker Road this would call for $9,300 for road construction and make the park much more interesting to tourists and open a section full of interest that is now too hard to reach.

Ladders, etc.—I would recommend the erection of new iron ladders in place of the wooden ones, both in the ruins and at the approaches thereto, and good strong iron railings in the dangerous places. For this work I have asked for the sum of $1,700.

Restoration of ruins.—I would recommend that the sum of $3,000 be appropriated for the purpose of restoring and protecting from decay Peabody House and Long House. These ruins are too fine to be allowed to remain as they are, and the work of restoration would preserve them from further decay.

The estimate for the fiscal year 1917 calls for the sum of $22,895.20, and I would most respectfully urge that this amount be appropriated.

Very respectfully,

THOMAS RICKNER,
Superintendent.

The SECRETARY OF THE INTERIOR.

APPENDIX.

RULES AND REGULATIONS OF MARCH 30, 1912.

Pursuant to authority conferred by the act of Congress approved June 29, 1906, the following rules and regulations for the government of the Mesa Verde National Park, in Colorado, are hereby established and made public and extended, as far as applicable, to all prehistoric ruins situated within 5 miles of the boundaries thereof on Indian and public lands not alienated by patent from the ownership of the United States:

1. It is forbidden to injure or disturb, except as herein provided, any of the mineral deposits, natural curiosities, wonders, ruins, and other works and relics of prehistoric or primitive man on Government lands within the park or the ruins and other works or relics of prehistoric man on Government lands within 5 miles of the boundaries of the park.

2. Permits for the examination of ruins, the excavation of archæological sites, and the gathering of objects of antiquity will, upon application to the Secretary of the Interior through the superintendent of the park, be granted to accredited representatives of reputable museums, universities, colleges, or other recognized scientific or educational institutions, with a view to increasing the knowledge of such objects and aiding the general advancement of archæological science, under the conditions and restrictions contained in present or future regulations promulgated by the Secretary of the Interior to carry out the provisions of the act of Congress approved June 8, 1906, entitled "An act for the preservation of American antiquities."

3. Persons bearing archæological permits from the department may be permitted to enter the ruins unaccompanied after presenting their credentials to the superintendent or other park officer. Persons without archæological permits who wish to visit and enter the ruins shall in all cases be accompanied by a park ranger or other person duly authorized by the superintendent.

4. The superintendent is authorized, in his discretion, to close any ruin on Government lands within the park, or the 5-mile limit, to visitors when it shall appear to him that entrance thereto would be dangerous to visitors or might result in injury to walls or other insecure portions thereof or during repairs.

5. The superintendent is authorized, in his discretion, to designate the place or places to be used by campers in the park and where firewood can be obtained by them. All garbage and refuse must be deposited in places where it will not be offensive to the eye or contaminate any water supply on the park lands.

6. It is forbidden to cut or injure any timber growing on the park lands, except as provided in paragraph 5 of these regulations; but dead or fallen timber may be taken by campers for fuel without obtaining permission therefor.

7. Fires should be lighted only when necessary and completely extinguished when not longer required. The utmost care must be taken at all times to avoid setting fire to the timber and grass.

8. Hunting or killing, wounding, or capturing any bird or wild animal on the park lands, except dangerous animals when necessary to prevent them from destroying life or inflicting an injury, is prohibited. The outfits, including guns, traps, teams, horses, or means of transportation used by persons engaged in hunting, killing, trapping, ensnaring, or capturing such birds or wild animals, or in possession of game killed on the park lands under other circumstances than those prescribed above, will be taken up by the superintendent and held subject to the order of the Secretary of the Interior, except in cases where it is shown by satisfactory evidence that the outfit is not the property of the person or persons violating this regulation and the actual owner thereof was not a party to such violation. Firearms will be permitted in the park only on written permission from the superintendent.

9. No person shall be permitted to reside permanently or to engage in any business on the Government lands in the park without permission, in writing, from the Secretary of the Interior. The superintendent may grant authority to competent persons to act as guides and revoke the same in his discretion, and no pack trains will be allowed in the park unless in charge of a duly registered guide.

10. Owners of patented lands within the park limits are entitled to the full use and enjoyment thereof; the boundaries of such lands, however, must be determined and marked and defined, so that they may be readily distinguished from the park lands. While no limitations or conditions are imposed upon the use of such private lands, so long as such use does not interfere with or injure the park, private owners must provide against trespass by their stock or cattle or otherwise upon the park lands, and all trespasses committed will be punished to the full extent of the law. Stock may be taken over the park lands to patented private lands with the written permission and under the supervision of the superintendent, but such permission and supervision are not required when access to such private lands is had wholly over roads or lands not owned or controlled by the United States.

11. Allowing the running at large, herding, or grazing of cattle or stock of any kind on the Government lands in the park, as well as the driving of such stock or cattle over same, is strictly forbidden, except where authority therefor has been granted by the superintendent. All cattle or stock found trespassing on the park lands will be impounded and disposed of as directed in regulations approved March 30, 1912.

12. The sale of intoxicating liquors on the Government lands in the park is strictly forbidden.

13. Private notices or advertisements shall not be posted or displayed on the Government lands within the park, nor upon or about ruins on Government lands within the 5-mile strip surrounding the same, except such as may be necessary for the convenience and guidance of the public.

14. Persons who render themselves obnoxious by disorderly conduct or bad behavior, or who may violate any of the foregoing rules,

will be summarily removed from the park and will not be allowed to return without permission, in writing, from the Secretary of the Interior or the superintendent of the park.

15. The act creating the park provides that any person or persons who may, without having secured proper permission from the Secretary of the Interior, willfully remove, disturb, destroy, or molest any of the ruins, mounds, buildings, graves, relics, or other evidences of an ancient civilization or other property in said park, shall be deemed guilty of a misdemeanor, and upon conviction before any court having jurisdiction of such offenses shall be fined not more than $1,000, or imprisoned not more than 12 months, or such person or persons may be fined and imprisoned, at the discretion of the court, and shall be required to restore the property destroyed, if possible.

Any person or persons guilty of such vandalism upon Government lands within the 5-mile strip will be liable to a penalty of $500, or imprisonment of not more than 90 days, or both, in the discretion of the court, as provided in the act of Congress approved June 8, 1906, entitled "An act for the preservation of American antiquities."

16. The superintendent designated by the Secretary of the Interior is hereby authorized and directed to remove all trespassers from the Government lands in the park, and to enforce these rules and regulations and all the provisions of the act of Congress creating the same.

The Indian police and field employees of the General Land Office are required to cooperate with the superintendent in the enforcement of these regulations as regards the 5-mile strip surrounding the park.

REGULATIONS OF MARCH 30, 1912, GOVERNING THE IMPOUNDING AND DISPOSITION OF LOOSE LIVE STOCK.

Horses, cattle, or other domestic live stock running at large or being herded or grazed on the Government lands in the Mesa Verde National Park without authority from the superintendent of the park, will be taken up and impounded by the superintendent, who will at once give notice thereof to the owner, if known. If the owner is not known, notices of such impounding, giving a description of the animal or animals, with the brands thereon, will be posted in six public places inside the park and in two public places outside the park. Any owner of an animal thus impounded may, at any time before the sale thereof, reclaim the same upon proving ownership and paying the cost of notice and all expenses incident to the taking up and detention of such animal, including the cost of feeding and caring for the same. If any animal thus impounded should not be reclaimed within 30 days from notice to the owner or from the date of posting notices, it shall be sold at public auction at such time and place as may be fixed by the superintendent after 10 days' notice, to be given by posting notices in six public places in the park and two public places outside the park, and by mailing to the owner, if known, a copy thereof.

All money received from the sale of such animals and remaining after the payment of all expenses incident to the taking up, impounding, and selling thereof, shall be carefully retained by the superintendent in a separate fund for a period of six months, during which time the net proceeds from the sale of any animal may be claimed by and paid to the owner upon the presentation of satisfactory proof of

ownership; and if not so claimed within six months from the date of sale such proceeds shall be turned into the Mesa Verde National Park fund.

The superintendent shall keep a record in which shall be set down a description of all animals impounded, giving the brands found on them, the date and locality of the taking up, the date of all notices and manner in which they were given, the date of sale, and the name and address of the purchaser, the amount for which each animal was sold, and the cost incurred in connection therewith, and the disposition of the proceeds.

The superintendent shall, in each instance, make every reasonable effort to ascertain the owner of animals impounded and give actual notice thereof to such owner.

PUNISHMENT FOR DEPREDATIONS AND FOR NOT EXTINGUISHING FIRES ON PUBLIC LANDS, ETC.

[Excerpt from an act entitled "An act to provide for determining the heirs of deceased Indians, for the disposition and sale of allotments of deceased Indians, for leasing of allotments, and for other purposes," approved June 25, 1910 (36 Stat., 857).]

SEC. 6. That section fifty of the act entitled "An act to codify, revise, and amend the penal laws of the United States," approved March fourth, nineteen hundred and nine (Thirty-fifth United States Statutes at Large, page one thousand and ninety-eight), is hereby amended so as to read:

"SEC. 50. Whoever shall unlawfully cut, or aid in unlawfully cutting, or shall wantonly injure or destroy, or procure to be wantonly injured or destroyed, any tree growing, standing, or being upon any land of the United States which, in pursuance of law, has been reserved or purchased by the United States for any public use, or upon any Indian reservation or land belonging to or occupied by any tribe of Indians under the authority of the United States, or any Indian allotment while the title to the same shall be held in trust by the Government, or while the same shall remain inalienable by the allottee without the consent of the United States, shall be fined not more than five hundred dollars or imprisoned not more than one year, or both."

That section fifty-three of said act is hereby amended so as to read:

"SEC. 53. Whoever shall build a fire in or near any forest, timber, or other inflammable material, upon the public domain, or upon any Indian reservation, or lands belonging to or occupied by any tribe of Indians under the authority of the United States, or upon any Indian allotment while the title to the same shall be held in trust by the Government, or while the same shall remain inalienable by the allottee without the consent of the United States, shall, before leaving said fire, totally extinguish the same; and whoever shall fail to do so shall be fined not more than one thousand dollars or imprisoned not more than one year, or both."

EXCERPT FROM THE DEFICIENCY APPROPRIATION ACT APPROVED JUNE 25, 1910.

The Secretary of the Interior may, upon terms and conditions to be fixed by him, grant leases and permits for the use of the land or development of the resources thereof in the Mesa Verde National Park,

and the funds derived therefrom shall be covered into the Treasury of the United States: *Provided*, That such leases or grants shall not include any of the prehistoric ruins in said park or exclude the public from free or convenient access thereto; for necessary expenses hereunder there is appropriated the sum of two thousand dollars, to continue available during the fiscal year nineteen hundred and eleven.

REGULATIONS OF MAY 18, 1914, GOVERNING THE ADMISSION OF AUTOMOBILES AND MOTOR CYCLES.

Pursuant to authority conferred by the act of June 29, 1906, setting aside certain lands in the State of Colorado as a public park, the following regulations governing the admission of automobiles and motor cycles into the Mesa Verde National Park are hereby established and made public:

1. No automobile or motor cycle will be permitted within the metes and bounds of Mesa Verde National Park unless the owners thereof secure a written permit from the superintendent or his representative. Permits may be secured at the superintendent's office at Mancos, Colo.

2. Applications for permit must show: (*a*) Name of owner, (*b*) number of machine, (*c*) name of driver, and (*d*) inclusive dates for which permit is desired, and be accompanied by a fee of $1 for a single trip or $5 for the season. Permits must be presented to the superintendent or his representative at Spruce Tree Camp. The permittee will not be allowed to do a commercial or transportation business in the park without a special license therefor from the Secretary of the Interior. All permits will expire on the 1st day of November of the year of issue.

3. The use of automobiles and cycle cars will be permitted on all roads in Mesa Verde National Park except that portion of the Mills survey between station 64 and station 327, not earlier than 6 a. m. nor later than 7 p. m. No machine will leave Spruce Tree Camp to make the trip to the northern boundary of the park later than 5 p. m.

4. When teams approach, motor vehicles will take position on the outer edge of the roadway, regardless of the direction in which they are going, taking care that sufficient room is left on the inside for the passage of teams.

5. Motors will stop when teams approach and remain at rest until teams have passed or until teamsters are satisfied regarding the safety of their teams.

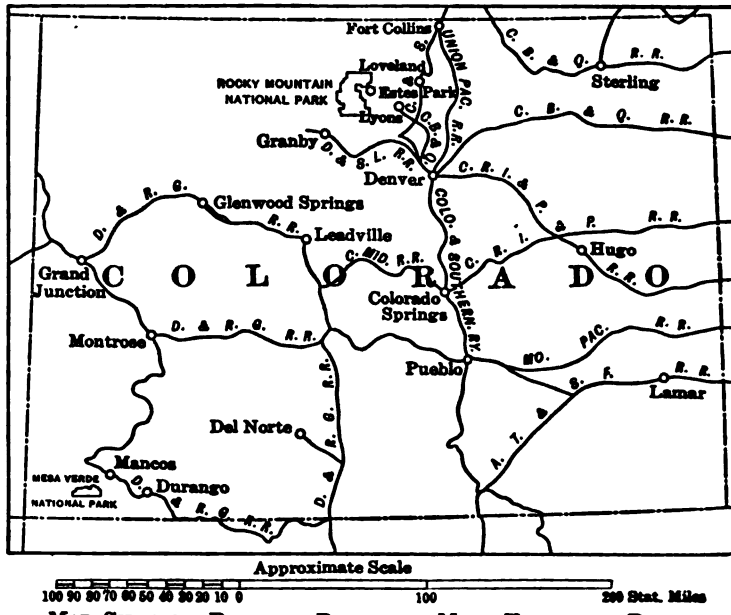
6. All machines will be limited to a speed of 6 miles per hour in making the ascent of the mesa or in making the descent therefrom between stations 0 and 62, and on all roads beyond station 62 speed will be limited to 8 miles per hour, except on straight stretches where approaching teams will be visible, when, if no teams are in sight, this speed may be increased; but in no event, however, shall it exceed 15 miles per hour.

7. Signal with horn will be given at or near every bend of the road to announce to approaching teams the proximity of the motors. At all turnouts between station 0 and station 62, and wherever signboards shall so announce, motors will stop on the outer edge of the turn and wait for three minutes to allow any vehicle time to become visible around the turns.

8. Teams have the right of way, and machines will be backed or otherwise handled, as necessary, so as to enable teams to pass with safety.

9. All persons when entering the park with machines are required to report at Spruce Tree Camp and register their names.

10. Violation of any of the foregoing rules or the general regulations for the government of the park will cause revocation of permit, will subject the owner of the machine to any damages occasioned thereby and to ejectment from the reservation, and be cause for refusal to issue a new permit to the owner without prior sanction in writing from the Secretary of the Interior.



MAP SHOWING RAILROAD ROUTES TO MESA VERDE AND ROCKY MOUNTAIN NATIONAL PARKS.

REPORT OF THE SUPERINTENDENT OF CRATER LAKE NATIONAL PARK.

REPORT OF THE SUPERINTENDENT OF CRATER LAKE NATIONAL PARK.

DEPARTMENT OF THE INTERIOR,
CRATER LAKE NATIONAL PARK,
OFFICE OF THE SUPERINTENDENT,
Medford, Oreg., October 1, 1915.

SIR: The annual report of conditions in the Crater Lake National Park, since the fiscal year ended June 30, 1914, is herewith submitted for your consideration.

GENERAL STATEMENT.

Crater Lake National Park was created by act of Congress approved May 22, 1902, and is located on the crest of the Cascade Mountains in southern Oregon, about 60 miles from the California line. It is approximately 13½ miles east and west and 18 miles north and south, and contains 249 square miles, including the wreck of Mount Mazama, at one time a giant among the mountains of the world. Subsequently all that portion above 8,000 feet elevation disappeared; sank into the bowels of the earth, leaving a vast crater 5½ miles in diameter, which gradually filled with pure, crystal water to a depth of 2,000 feet, on all sides of which the walls of the cauldron still tower to a height of from 500 to nearly 2,000 feet.

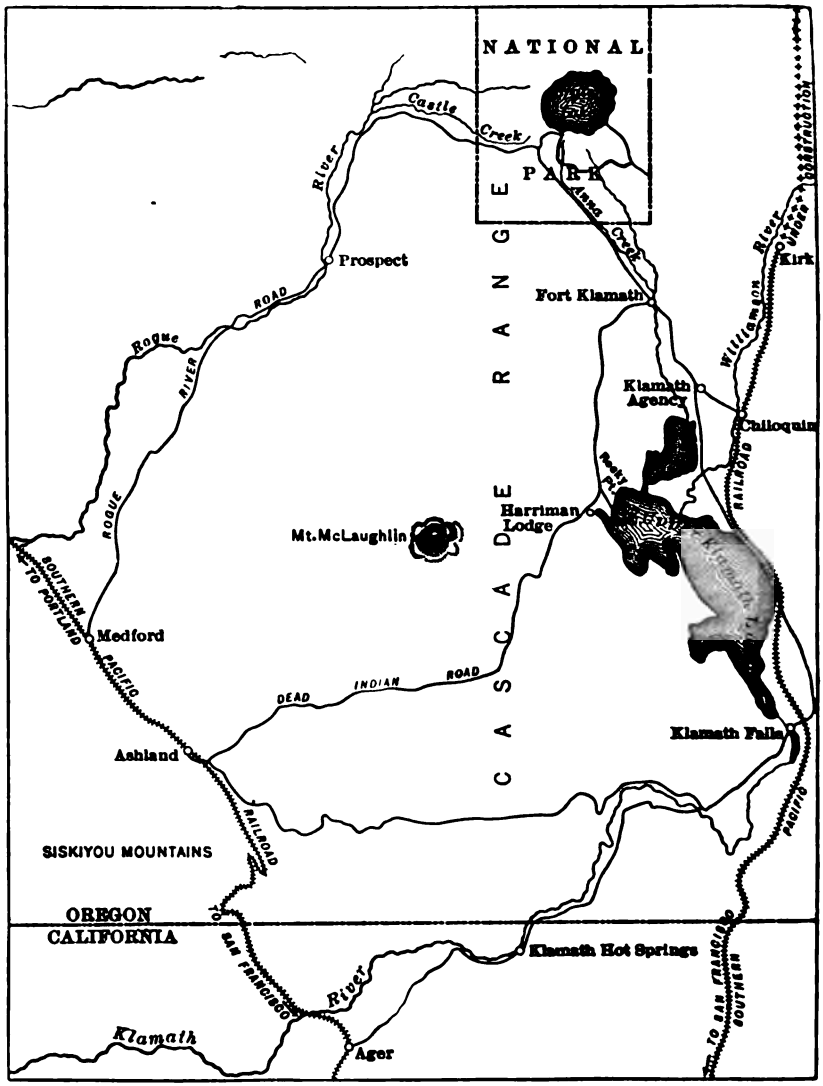
It was first discovered by white men on June 12, 1853. There were 22 prospectors in the party, of whom the leader, Mr. John W. Hillman, then of Jacksonville, Oreg., was the last survivor. Mr. Hillman died in Hope Villa, La., February 19, 1915, at the advanced age of 83 years.

It was but little known, even among residents of southern Oregon, when the writer, on August 16, 1885, started a movement for the creation of a national park, which was successful only after 17 years of strenuous labor. Then came a long struggle for development, which is just now beginning to bear fruit. Probably the first step in that direction consisted in stocking the lake with rainbow trout, which was also done by the writer, who, in 1888, carried a few minnows nearly 50 miles and got them into the waters of the lake in good shape. The fishing now is unsurpassed and the fish are of excellent quality.

ROADS.

Several years ago an appropriation was made by Congress for the survey of a comprehensive system of roads within the park, the main feature of which consisted in a road entirely around the lake, close to the rim whenever possible. This survey was made under the direction of the Secretary of War, two seasons being required to

complete it, and a report thereof was submitted to Congress, estimating the total cost, including $65,000 for a sprinkling plant, at approximately $700,000, and recommending that it be placed under the continuing contract feature in a manner similar to certain har-



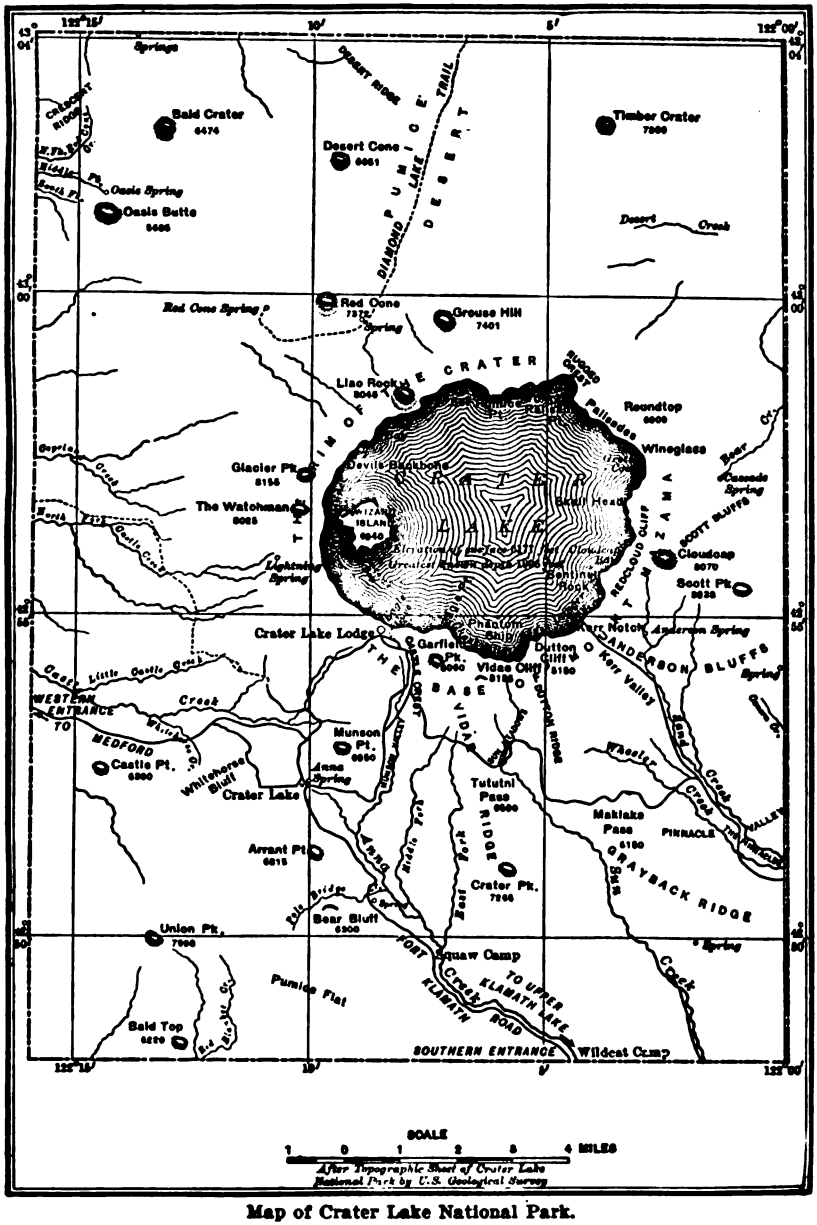
Map showing routes to Crater Lake.

bors. Of this amount an appropriation was made of $125,000 for use during the season of 1913, $85,000 for 1914, and $50,000 for 1915.

Under these appropriations grading has proceeded steadily, resulting in new roads from the Klamath, Medford, and Pinnacles entrances to the rim of the lake, together with that portion of the

rim road extending from Cloudcap, on the easterly side, to the Watchman, on the westerly side, being 44 miles in all.

This is about two-thirds of the roads it is proposed to build, but owing to the fact that the soil is extremely light and cuts deeply by



Map of Crater Lake National Park.

travel, so that late in the season it is almost impassable, it is necessary at this time to pave them, then to construct and pave the remainder of the proposed system.

TRANSPORTATION.

A line of automobile stages is maintained by the Crater Lake Co. from Medford, on the main line of the Southern Pacific Railway, and from Chiloquin, on the northerly extension of the Southern Pacific from Klamath Falls, or the Crater Lake cut-off, that has rendered eminently satisfactory service. It is now possible to buy tickets from Portland to California points, or vice versa, and go via Crater Lake, at an additional expense of $13 for automobile fare between Medford and Chiloquin. Private automobiles and vehicles will now find good roads leading to the park during the season not only from Klamath and Medford but also from central Oregon by way of the Pinnacles entrance, on Sand Creek.

HOTELS.

During the season of 1915 Crater Lake Lodge was opened to the public and is located directly on the rim of the lake, nearly 1,000 feet above the water, where comfortable quarters are available for guests. The lodge is a cut-stone building containing about 60 rooms, some of which contain hot and cold water and other conveniences. During the season of 1916 it is proposed to build along the entire front of this building, over 100 feet, a 16-foot porch and pergola, from which one can look directly into the lake, nearly 1,000 feet below. Tents will also be provided for those desiring them.

Besides the lodge, Anna Spring Camp, adjoining park headquarters, 5 miles from the lake, is maintained at cheaper rates, where comfortable quarters may be obtained, together with well-floored tents. A general merchandise store is also maintained at this point, where gasoline and other supplies may be obtained.

Free camping privileges are open to the public, subject only to rules and regulations of the Interior Department.

FISH AND GAME.

There are no fish in any of the waters of the park except the lake itself and Anna Creek, below the falls. Crater Lake is abundantly supplied with a fine quality of rainbow trout, and during the past season I placed 15,000 black spotted fry in the lake successfully that will soon be available. No fishing is permitted except with hook and line, and a limit of five in one day is maintained. The fish are large and the flesh is firm. A few have been taken 28 inches long, weighing 6 or 7 pounds.

The park abounds in black and brown bear, black-tailed deer, cougar, lynx, timber wolves, coyotes, pine marten, fisher, several varieties of squirrels, ringtail grouse, the common pheasant, Clark crow, and numerous varieties of birds common to the country at large.

FOREST FIRES.

The past season was the third unusually dry summer in succession, and forest fires were of frequent occurrence. However, they were kept well under control, so that no serious damage resulted.

WATER SYSTEM.

During the past season a water system was installed at an expense of $1,200 that meets immediate necessities, but should be materially extended as soon as funds will permit. At this time it consists of a main water line approximately 1,000 feet long, containing 332 feet of 3-inch and 670 feet of 2-inch pipe, with branch lines to the various buildings of approximately 500 feet of three-fourths-inch pipe. Modern plumbing has been installed in the superintendent's residence, consisting of bath, toilet, lavatory, kitchen sink, hot and cold water. A sewer system has been installed that can be extended as may be necessary. It is connected with a cesspool 10 feet deep, and as the soil is of an extremely light, porous nature, it will doubtless serve every purpose for many years. However, it is only a question of time when something better will have to be provided. Temporary sprinkling facilities have been provided, but it will soon be necessary to materially increase the supply of water by providing another tank. A public watering trough and a permanent water supply for the barn have been provided. A new hydraulic ram, fully equal to the present water supply, has been installed, but during the season of 1916 an additional tank should be placed above the present one, which latter should then be used for conserving the overflow for irrigating, and with such facilities there would be adequate protection against fire.

TELEPHONE SYSTEM.

Telephone facilities of the park have never been satisfactory, so during the past season private lines in the park were purchased and necessary lines constructed. Direct connection with Klamath Falls by way of Fort Klamath has been maintained for a number of years, but never before has there been direct connection with Medford and the Rogue River Valley. I was unable to build beyond the park line, which would leave a distance of 23 miles to connect at Prospect, and as the prospective business would not justify the expense of construction by a commercial organization, I was forced to provide ways and means, which I did by securing sufficient voluntary contributions, with which a good line was built and is now in excellent working order. A switchboard has been provided for the park office, and all lines are controlled therein.

RECOMMENDATIONS.

ADMINISTRATION BUILDING.

The park office has entirely outgrown its usefulness, in that it is totally inadequate for the purpose. The park office proper and the post office are located in a little room 8 by 12 feet, into which at times 40 and 50 people try to crowd and transact business. When the mail arrives on busy days it is simply a physical impossibility to transact business expeditiously or at all satisfactorily either to the public or the employees.

A new modern building should be provided, as soon as possible, of sufficient capacity to meet all requirements for many years to come. The business is increasing rapidly and facilities for the systematic handling of it should keep pace therewith. Aside from convenient

facilities for handling a greatly increased business, provision should be made for the public in the way of toilets, waiting rooms, and other comforts and conveniences.

TUNNEL TO THE LAKE.

From Crater Lake Lodge to the lake is a drop of nearly 1,000 feet, and to reach the lake a trail of 2,300 feet is provided. Owing to the rugged nature of the rim, this trail is necessarily steep and hard to climb, and many visitors are unable to go over it, so that they are denied the privilege of fishing or boating on the lake. This condition of affairs is a disappointment to many visitors and some sort of provision should be made to overcome it. A lift or other installation within the rim is wholly impracticable, for the reason that every spring enormous slides of snow and rocks would sweep any sort of framework into the lake. Under such conditions I would suggest the construction of a tunnel from a convenient point on the road, several hundred feet below the rim, to the surface of the water. With this end in view, an appropriation of $1,000 is desired, with which to make investigations, surveys, etc.

PARK BOUNDARIES.

Since my report for 1914 was issued the matter of extending the park boundaries so as to include Mount Thielsen, Diamond Lake, and Old Bailey has been considered by the forest supervisors and myself, and we have agreed to report jointly in favor of the following limits:

Commencing at the western extremity of the south boundary of the Crater Lake National Park, thence west approximately three-quarters of a mile to the boundary between Klamath and Jackson Counties, thence north along said county line to a point on the boundary between Douglas and Jackson Counties, thence east to a point due north of the present western line of the park, thence north to a point 2 miles north of the sixth standard parallel, thence east to a point on the east boundary of the Umpqua National Forest, thence southerly along the said eastern boundary of the Umpqua National Forest to the present north line of the Crater Lake National Park.

It is to be hoped that Congress will accept these lines and establish a permanent boundary during the next session and that the system of roads now under construction within the park will be immediately extended to the new territory.

DRIVING LOOSE STOCK THROUGH THE PARK.

Eight permits were issued during the season for driving loose stock through the park, as follows: On June 18, 1915, a permit was granted to J. E. Pelton to drive 270 loose cattle from Roseburg, Oreg., to Fort Klamath, Oreg.; on June 27 a permit was granted to H. M. Morgan to drive 20 loose cattle from Trail, Oreg., to Fort Klamath, Oreg.; on August 1 a permit was granted to J. C. Fichter to drive 91 loose cattle from Myrtle Point, Oreg., to Fort Klamath, Oreg., and again on August 12 a permit was granted to him to drive 9 loose horses from Fort Klamath, Oreg., to Myrtle Point, Oreg.; on September 10 a permit was granted to Edward Cook to drive 3 loose cattle from Fort Klamath, Oreg., to Butte Falls, Oreg.; and on September 23 a permit was granted to Jay J. Arant to drive 902 loose sheep from Fort Klamath, Oreg., to Prospect, Oreg. Total, 902 sheep, 384 cattle, and 9 horses.

CONCESSIONS.

The following concessions have been granted:

The Crater Lake Co. (A. L. Parkhurst, manager).—Lease for 20 years beginning June 1, 1912, approved August 6, 1912, authorizes the construction, maintenance, and operation of hotels, inns, lunch stations, and buildings, for use as barns, etc., general stores for handling tourists' supplies, hire of rowboats on Crater Lake, and operation of power boats and gasoline launches thereon, for accommodation of tourists, with use of land embraced in the following sites:

	Acres.	
Crater Lake Lodge tract	43.26	
Wineglass tract	11.83	
	55.09	
At an annual charge of $2 per acre		$110.18

Miller Photo Co.—License for photographic privilege, with sale of views and post cards, for period June 15–Oct. 31, 1915, approved May 3, 1915. Fee exacted for privilege 10.00

120.18

AUTOMOBILES AND MOTOR CYCLES.

During the 1915 park season there were issued 2,231 round-trip automobile permits at $1 each and 13 season automobile permits at $5 each (apart from the 7 automobiles used by the Crater Lake Co. for commercial transportation business); also 30 round-trip motorcycle permits at $1 each, with a total return of $2,004, as against 1,047 round-trip auto permits at $1 each, 8 season auto permits at $5 each, and 18 motorcycle permits at $1 each, with a total of 1,105 during the 1914 park season.

VISITORS.

At the close of September there were 11,371 visitors, as against 7,096 at the same time in 1914, divided as follows:

Visitors to Crater Lake National Park (by States and countries).

Alabama	1	Nebraska	25
Alaska	2	Nevada	25
Arizona	12	New Hampshire	5
Arkansas	2	New Jersey	29
California	1,147	New Mexico	2
Colorado	15	New York	189
Connecticut	19	North Carolina	1
Delaware	1	North Dakota	6
District of Columbia	22	Ohio	61
Florida	7	Oklahoma	12
Georgia	5	Oregon	8,869
Hawaii	34	Pennsylvania	68
Idaho	71	Philippines	1
Illinois	110	Rhode Island	2
Indiana	28	Tennessee	2
Iowa	35	Texas	25
Kansas	33	Utah	15
Kentucky	7	Vermont	6
Louisiana	2	Washington	305
Maine	4	West Virginia	11
Maryland	6	Wisconsin	20
Massachusetts	38	Wyoming	4
Michigan	37	Canada	12
Minnesota	22	England	1
Mississippi	1	Sweden	1
Missouri	52		
Montana	13	Total	11,371

Every State in the Union was represented excepting South Carolina, South Dakota, and Virginia.

Cancellations in the post office amounted to $130.20, and 87 money orders were issued, amounting to $1,100.09, as against $108.43 in cancellations and 78 money orders, amounting to $638.53, in 1914.

Respectfully,

WILL G. STEEL,
Superintendent.

The SECRETARY OF THE INTERIOR.

RULES AND REGULATIONS.

GENERAL REGULATIONS OF MARCH 30, 1912.

By an act of Congress approved May 22, 1902, the tract of land bounded north by the parallel 43° 4′ north latitude, south by 42° 48′ north latitude, east by the meridian 122° west longitude, and west by the meridian 122° 16′ west longitude, having an area of 249 square miles, in the State of Oregon, and including Crater Lake, has been reserved and withdrawn from settlement, occupancy, or sale under the laws of the United States, and dedicated and set apart forever as a public park or pleasure ground for the benefit of the people of the United States, to be known as Crater Lake National Park.

The park by said act is placed under the exclusive control of the Secretary of the Interior, and these rules and regulations are made and published in pursuance of the duty imposed on him in regard thereto.

1. It is forbidden to injure or destroy in any manner, any of the natural curiosities or wonders within the park, or to disturb the mineral deposits in the reservations, except under the conditions prescribed in paragraph 11 of these regulations.

2. It is forbidden to cut or injure any timber growing on the park lands, except for use in the construction of places of entertainment and in connection with the working of located mining claims, or to deface or injure any Government property. Camping parties and others on the reservation will be allowed to use dead or fallen timber for fuel in the discretion of the superintendent.

3. Fires should be lighted only when necessary and completely extinguished when not longer required. The utmost care must be exercised at all times to avoid setting fire to the timber and grass.

4. Hunting or killing, wounding, or capturing any bird or wild animal on the park lands, except dangerous animals when necessary to prevent them from destroying life or inflicting an injury, is prohibited. The outfits, including guns, traps, teams, horses, or means of transportation used by persons engaged in hunting, killing, trapping, ensnaring, or capturing such birds or wild animals, or in possession of game killed on the park lands under other circumstances than prescribed above, will be taken up by the superintendent and held subject to the order of the Secretary of the Interior, except in cases where it is shown by satisfactory evidence that the outfit is not the property of the person or persons violating this regulation and the actual owner thereof was not a party to such violation. Firearms will only be permitted in the park on written permission from the superintendent thereof.

5. Fishing with nets, seines, traps, or by the use of drugs or explosives, or in any other way than with hook and line, is prohibited

Fishing for purposes of merchandise or profit is forbidden. Fishing may be prohibited by order of the superintendent in any of the waters of the park, or limited therein to any specified season of the year, until otherwise ordered by the Secretary of the Interior.

All fish less than 8 inches in length should be at once returned to the water with the least damage possible to the fish. Fish that are to be retained must be at once killed by a blow on the back of the head or by thrusting a knife or other sharp instrument into the head.

6. No person will be permitted to reside permanently, engage in any business, or erect buildings, etc., upon the Government lands in the park without permission, in writing, from the Secretary of the Interior. The superintendent may grant authority to competent persons to act as guides and revoke the same in his discretion. No pack trains will be allowed in the park unless in charge of a duly registered guide.

7. Owners of patented lands within the park limits are entitled to the full use and enjoyment thereof; the boundaries of such lands, however, must be determined and marked and defined, so that they may be readily distinguished from the park lands. While no limitations or conditions are imposed upon the use of such private lands so long as such use does not interfere with or injure the park, private owners must provide against trespass by their stock or cattle, or otherwise, upon the park lands, and all trespasses committed will be punished to the full extent of the law. Stock may be taken over the park lands to patented private lands with the written permission and under the supervision of the superintendent, but such permission and supervision are not required when access to such private lands is had wholly over roads or lands not owned or controlled by the United States.

8. Allowing the running at large, herding, or grazing of cattle or stock of any kind on the Government lands in the park, as well as the driving of such stock or cattle over same, is strictly forbidden, except where authority therefor has been granted by the superintendent. All cattle or stock found trespassing on the park lands will be impounded and disposed of as directed in regulations approved March 30, 1912.

9. No drinking saloon or barroom will be permitted upon Government lands in the park.

10. Private notices or advertisements shall not be posted or displayed on the Government lands within the reservation, except such as may be necessary for the convenience and guidance of the public.

11. The act provides that, under such regulations as the Secretary of the Interior may prescribe, the reservation shall be open "to the location of mining claims and the working of the same." It was not the purpose of this provision to extend the mining laws to the park without limitation, but only to authorize the location and working of mining claims thereon, under regulations to be prescribed by the Secretary of the Interior, and in such manner as not to interfere with or prejudically affect the general purpose for which the reservation was established. It is therefore prescribed:

(*a*) That persons desiring to locate mining claims within the park shall enroll their names and addresses with the superintendent of the reservation and shall file with such superintendent a description, in

writing, of the land desired to be located. They shall also file with the superintendent evidence that they are severally qualified to make locations under the mining laws, and before entering upon the park for such purpose they must obtain from the Secretary of the Interior, through the superintendent, a written permit to do so. Such permit will be issued only upon condition that the applicant or applicants therefor, while upon the reservation, will not destroy or damage any game, fish, timber, or natural objects therein, and will strictly observe and comply with the requirements of the law and these regulations.

(*b*) Lands in the park upon which valuable deposits of mineral shall have been or may be found may be located under the mining laws by any person or persons duly qualified and holding a permit such as is described in the preceding paragraph, and such person or persons, his or their successor or successors in interest, may work the claim or claims so located; but in carrying on the work he or they shall in all respects observe and comply with the provisions of the statute creating the park and with these regulations: *Provided*, That such person or persons may, as the proper working of such mining claim or claims shall require, be permitted to use for mining purposes such timber or stone found upon the land located as in the judgment of the superintendent may be so used without injury or damage to the reservation "as a public park or pleasure ground:" *And provided further*, That within 30 days after the location of any mining claim within the park, and before development work thereon shall be commenced, a copy of the notice of location shall be filed with the superintendent, together with proof satisfactorily showing that discovery of a valuable mineral deposit has been made within the limits of the location, and, if it be a placer location, that every 10-acre tract embraced therein has been found to contain valuable deposits of mineral.

(*c*) The statute does not authorize the purchase of or the acquisition of the legal title to lands located as mining claims within the park. The rights of the locator or locators, therefore, will be at all times subject to forfeiture upon breach of any of the conditions mentioned in the permit herein provided for, or upon refusal or failure to comply with any of the provisions of the statute or of these regulations.

(*d*) Upon breach of any such conditions, or upon refusal or failure to comply in all respects with the provisions of the statute and of these regulations, or where locators of mining claims do not appear to be acting in good faith, or who after location do not work their claims in such manner as to show good faith in the assertion thereof, the superintendent will revoke their permits, forthwith remove them from the park, and report the facts to the Secretary of the Interior.

12. Persons who render themselves obnoxious by disorderly conduct or bad behavior, or who violate any of the foregoing rules, will be summarily removed from the park and will not be allowed to return without permission, in writing, from the Secretary of the Interior or the superintendent of the park.

No lessee or licensee shall retain in his employ any person whose presence in the park shall be deemed and declared by the superintendent to be subversive of the good order and management of the reservation.

13. Any person who violates any of the foregoing regulations will be deemed guilty of a misdemeanor, and upon conviction be fined not more than $500 or imprisoned not more than one year, and shall be liable for any loss sustained by the United States as a result of such violation, as provided by the act creating the park.

14. The superintendent designated by the Secretary is hereby authorized and directed to remove all trespassers from the Government lands in the park and enforce these rules and regulations and all the provisions of the act of Congress aforesaid.

INSTRUCTIONS OF SEPTEMBER 17, 1913.

Visitors to the Crater Lake National Park are hereby notified that when dogs are taken through the park they must be prevented from chasing the animals and birds or annoying passers-by. To this end they must be carried in the wagons or led behind them while traveling and kept within the limits of the camp when halted. Any dog found at large in disregard of these instructions will be killed.

REGULATIONS OF MARCH 30, 1912, GOVERNING THE IMPOUNDING AND DISPOSITION OF LOOSE LIVE STOCK.

Horses, cattle, or other domestic live stock running at large or being herded or grazed in the Crater Lake National Park without authority from the Secretary of the Interior will be taken up and impounded by the superintendent, who will at once give notice thereof to the owner, if known. If the owner is not known, notice of such impounding, giving a description of the animal or animals, with the brands thereon, will be posted in six public places inside the park and in two public places outside the park. Any owner of an animal thus impounded may, at any time before the sale thereof, reclaim the same upon proving ownership and paying the cost of notice and all expenses incident to the taking up and detention of such animal, including the cost of feeding and caring for the same. If any animal thus impounded shall not be reclaimed within 30 days from notice to the owner or from the date of posting notices, it shall be sold at public auction at such time and place as may be fixed by the superintendent, after 10 days' notice, to be given by posting notices in six public places in the park and two public places outside the park, and by mailing to the owner, if known, a copy thereof.

All money received from the sale of such animals and remaining after the payment of all expenses incident to the taking up, impounding, and selling thereof shall be carefully retained by the superintendent in a separate fund for a period of six months, during which time the net proceeds from the sale of any animal may be claimed by and paid to the owner upon the presentation of satisfactory proof of ownership, and if not so claimed within six months from the date of sale such proceeds shall be turned into the Crater Lake National Park fund.

The superintendent shall keep a record, in which shall be set down a description of all animals impounded, giving the brands found on them, the date and locality of the taking up, the date of all notices and manner in which they were given, the date of sale, the name and

address of the purchaser, the amount for which each animal was sold and the cost incurred in connection therewith, and the disposition of the proceeds.

The superintendent will, in each instance, make every reasonable effort to ascertain the owner of animals impounded and to give actual notice thereof to such owner.

REGULATIONS OF MARCH 30, 1912, GOVERNING THE ADMISSION OF AUTOMOBILES AND MOTOR CYCLES.

Pursuant to authority conferred by the act of May 22, 1902 (32 Stats., 202), setting aside certain lands in the State of Oregon as a public park, the following regulations governing the admission of automobiles into the Crater Lake National Park are hereby established and made public:

1. No automobile will be permitted within the metes and bounds of the Crater Lake National Park unless the owner thereof secures a written permit from the superintendent or his representative.

2. Applications for permits must show: (*a*) Name of owner, (*b*) number of machine, (*c*) name of driver, and (*d*) inclusive dates for which permit is desired, not exceeding one year, and be accompanied by a fee of $1 for a single round trip through the park or a fee of $5 per annum for each machine for personal use and not for hire.

Permits must be presented to the superintendent or his authorized representative at the rangers' headquarters on the Government roads. Permittees will not be allowed to do a commercial transportation business in the park without a special license therefor from the Secretary of the Interior. All permits granted at any time when automobiles can enter the park will expire on December 31 of the year of issue.

3. The use of automobiles will be permitted on the Government roads from the southern and western boundaries of the park between the hours of 6.30 a. m. and 10.30 a. m., and between the hours of 3.30 p. m. and 6.30 p. m.

4. When teams approach, automobiles will take position on the outer edge of roadway, regardless of the direction in which they are going, taking care that sufficient room is left on the inside for the passage of teams.

5. Automobiles will stop when teams approach and remain at rest until teams have passed or until teamsters are satisfied regarding the safety of their teams.

6. Speed will be limited to 6 miles per hour, except on straight stretches where approaching teams will be visible, when, if no teams are in sight, this speed may be increased to the rate indicated on signboards along the road; in no event, however, shall it exceed 15 miles per hour.

7. Signal with horn will be given at or near every bend to announce to drivers of approaching teams the proximity of an automobile.

8. Teams have the right of way, and automobiles will be backed or otherwise handled, as necessary, so as to enable teams to pass with safety.

9. Violation of any of the foregoing rules or the general regulations for the government of the park will cause revocation of permit,

will subject the owner of the automobile to any damages occasioned thereby and to ejectment from the reservation and be cause for refusal to issue a new permit to the owner without prior sanction in writing from the Secretary of the Interior.

10. All persons passing through the park with automobiles are required to stop at the superintendent's headquarters or the rangers' headquarters and register their names.

11. These rules are also applicable to motor cycles, which may use the park roads on payment of a fee of $1 for each machine per annum. Permits issued therefor shall expire on December 31 of the year of issue.

REPORT OF THE SUPERVISOR OF THE GLACIER NATIONAL PARK.

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REPORT OF THE SUPERVISOR OF THE GLACIER NATIONAL PARK.

DEPARTMENT OF THE INTERIOR,
GLACIER NATIONAL PARK,
OFFICE OF THE SUPERVISOR,
Belton, Mont., September 28, 1915.

SIR: I have the honor to submit the following report on Glacier National Park for 1915:

GENERAL STATEMENT.

The Glacier National Park was established by the act of Congress approved May 11, 1910 (36 Stat. L., 354), and is located in northwestern Montana. It embraces over 1,400 square miles of the Rocky Mountains and adjacent territory, extending north from the main line of the Great Northern Railway to the Canadian border. The eastern boundary is the Blackfeet Indian Reservation, and the western boundary is formed by the Flathead River. The park, which is irregular in shape, has an area of approximately 915,000 acres. Its greatest length in a northwesterly-southeasterly direction is about 60 miles with a maximum width approaching 40 miles.

Within its borders are attractions for the scientist, nature lover, and tourist unsurpassed in any country in the world, tourists of world-wide experience pronouncing it the Switzerland of America. The elevations in the park range from 3,100 feet to over 10,400 feet. The central portion of the area on the northwestern-southeastern axis is high and rugged and in sharp comparison with the open plains of the east and the valley of the Flathead River on the west. Within its confines are 60 active glaciers, these ice sheets being the sources of beautiful cascades and roaring mountain streams flowing into innumerable clear placid lakes for which the park is famed, the most noted of these being Lake McDonald, Lake St. Mary, Lake Ellen Wilson, Iceberg Lake, Red Eagle Lake, Kintla Lake, Bowman Lake, Waterton Lake, Logging Lake, Quartz Lake, Harrison Lake, and Two Medicine Lake.

Lake McDonald, the southern end of which is situated 2½ miles from Belton, a station on the main line of the Great Northern Railway, is one of the most beautiful lakes in America. It is about 3,150 feet above sea level, nearly 10 miles long, 2 miles wide, and surrounded by mountains covered with virgin forests of western larch, cedar, white pine, Douglas fir, spruce, and hemlock. Upper Lake St. Mary is on the eastern side of the mountains about 32 miles northwest of Glacier Park station. It is about 10 miles long, with a maximum width of 1 mile, and toward the upper end the mountains rise in rugged walls not far from the water's edge. Its elevation is about

4,470 feet above sea level. The principal glaciers in the park are Blackfoot, Grinnell, Harrison, Pumpelly, Red Eagle, Sperry, Kintla, Agassiz, Chaney, Rainbow, and Carter. In most of the lakes of the park there is excellent fishing at certain times of the year, and at others many streams afford fine sport with hook and line. Within the park boundaries there are many varieties of game which are indigenous to this section of the country, such as bear, elk, moose, deer, bighorn sheep, mountain goat, mountain lion, as well as the smaller furred animals of the forest.

ROADS.

There are now approximately 78 miles of road within the park available for vehicle transportation.

St. Mary-Babb Road.—This road extends from St. Mary camp to the foot of the Lower St. Marys Lake, a distance of approximately 10 miles. Work was commenced on this road August 31, 1914, as reported in my last annual report, since which time the road has been graded to a minimum width of 14 feet and a maximum width of 20 feet. Additional drainage was installed and 520 yards of the road has been graveled.

Two Medicine Road.—Four thousand nine hundred and nine feet was cleared 30 feet wide and graded to a width of 16 feet at a cost of $3,800.

Many-Glacier Highway.—Work of repairing this road started on April 28, 1915, and three teams and five men were employed on this road until the close of the last fiscal year. Approximately 5 miles of road was repaired and 6 new culverts were installed and drain ditches opened up. On July 19, 1915, the new work of graveling was started on this road and an average of 12 teams and 15 men were employed; 1,668 yards of the road has been graveled up to date. Two teams and four men were employed cleaning out drains, repairing road for graveling, and putting in culverts from July 20 to September 14, 1915.

On the Many-Glacier Highway between the park line and the St. Mary River, outside of the Glacier National Park, an average of 27 teams and 35 men were employed on this road since July 27 hauling and spreading gravel, cleaning drain ditches, and installing culverts. Approximately 5,000 yards of gravel has been delivered and spread upon the road up to date.

Divide Creek Road—New drainage has been provided for this road and heavy slides removed from the grade at Divide Creek. Three hundred and eighty yards of the road has been resurfaced with gravel. Grader and drag has been placed upon the road after every heavy rain to keep it in repair.

Cut Bank Road.—The Cut Bank Road from the park line to the main traveled automobile road has been kept in repair. Eighteen new culverts have been installed and road has been graded approximately 3 feet wider for a distance of 4 miles. The repair work on this road was done out of the $1,000 allotted by the Department out of the 1916 Glacier National Park appropriation.

Lower Two Medicine Road.—This road extends from the park line to the main traveled automobile road. Approximately 3 miles of the road was repaired, culverts installed, grading and graveling work

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done at a cost of $1,000 which was allotted by the department out of the 1916 Glacier National Park appropriation for this purpose.

Belton-Lake McDonald Road.—For a distance of 3 miles this road was repaired by removing fallen timber, filling in ruts and removing slides which occurred along the Flathead River for a distance of one-half mile. One man was kept on the road all summer keeping it in repair.

Fish Creek Road.—This road was cleaned of fallen timber, rock, and earth slides and the road repaired the entire distance of 1.9 miles.

Flathead River Road.—Fallen timber was removed from this road from the foot of Lake McDonald to the Canadian line, a distance of 48 miles.

Fish Creek-McGee Meadow Road.—Length 25,080 feet. The right of way on this road has been cut and stumps removed for a distance of 21,000 feet. The grading is 85 per cent completed over a distance of 3 miles.

TRAILS.

All old trails were cleaned of fallen timber and kept in repair during the summer. The following new trails were built:

Cut Bank Pass Trail to Cut Bank Camp.—This trail was practically rebuilt for a distance of 8½ miles. Timber was cleared to a width of 10 feet, grade in timber 3 feet and in rock 4 feet. New trail was constructed from Two-Medicine Chalets to Cut Bank Pass, a distance of 8 miles. The trail was graded through timber to a width of 3 feet and in rock to 4 feet.

Cut Bank Trail.—This trail was built from Cut Bank Creek to the summit of Triple Divide Mountain, a distance of 7 miles, width of clearing 10 feet, width of grade 3 feet. Two and one-half miles of this trail was earth-and-dirt work and 4½ miles principally rock work.

Logging Lake Trail.—This trail is 7 miles in length and cleared 8 feet wide and graded an average width of 3 feet. Four miles of this trail was built through light timber and 3 miles through heavy growth of timber.

Quartz Lake Trail.—This trail is 6 miles in length and is graded to a width of 2½ feet. Clearing is 8 feet wide through very heavy timber.

Bowman and Quartz Lake Trails.—Three and one-half miles of clearing is through heavy timber cleared to a width of 8 feet and graded to a width of 3 feet.

Bowman Lake Trail.—Three and one-half miles of new trail cleared 8 feet wide through heavy timber and graded to a width of 2½ feet.

BRIDGES.

Logging Creek Bridge.—This bridge is 72 feet long, and a new covering was put on the bridge 12 feet wide and guardrails were placed upon both sides.

Quartz Creek Bridge.—The Quartz Creek Bridge is 78 feet long and 12 feet wide; 56 feet of new covering was placed upon it during the year.

Bowman Creek Bridge.—This bridge is 185 feet in length. Two new stringers were placed on this bridge, and an entire new covering 12 feet wide was placed upon it.

A new bridge was built across swamp on Lake McDonald Trail, 108 feet long and 8 feet wide, containing 5 piers and ground sill at each end. Guardrails were placed on each side the entire length.

Belton Bridge.—Bridge across the Middle Fork of the Flathead River at park line, length 235 feet, width 12 feet; 10 new stringers were placed on this bridge 10 by 10 inches. The entire bridge was refloored with 3-inch lumber. New guardrail was placed on each side.

BUILDINGS.

McDermott barn.—This barn was built at the McDermott ranger station. It is 16½ by 19½ by 12 feet high, and is constructed of logs with shingle roof.

Ranger cabin, Surprise Pass.—Size 14 by 14 feet; built of logs, hewed and peeled. Roof made of logs, with dirt covering. Floored with logs.

Fish Creek ranger station.—Size of building 32 by 36 feet; 9-foot ceiling, 2 porches 8 by 36 feet. Rustic sided cabin containing five rooms and one bathroom downstairs and two rooms upstairs. Ceiled with rough lumber, covered with deadening felt. Two flues 17 by 17 inches, 16 feet high, were also built.

St. Mary ranger station.—This station was repaired; woodshed and small barn for park ranger's horse built.

Warehouse.—Building 20 by 20 feet; 14-foot wall, 10-foot ceiling, three full windows, one sliding door downstairs, one small door in gable; 6,589 feet of rough lumber and 6,500 shingles were used in its construction.

Cabins repaired at headquarters.—Two porches 10 by 22 feet were built on the cabin in which the supervisor resides. One bathroom was partitioned off, size 10 by 14 feet, with 8-foot ceiling, and one woodshed 10 by 16 feet was built.

Messhouse.—A woodshed was constructed, 14 by 16 feet; one porch 10 by 16 feet, and one brick chimney built and ceiling joists and plumbing installed.

Clerk's residence.—Two rooms downstairs floored, ceiled, and partitioned. Floor of matched lumber; ceiling and partitions of beaded ceiling. Bathroom and bedroom built in garret, floored and ceiled. One roothouse 12 by 14 feet, 7 feet high, constructed. One porch 12 by 14 feet and 8 feet high and one woodshed 16 by 22 feet were also built.

One woodshed 12 by 12 feet was constructed near the office.

Sawmill and logging operations.—Forty-five thousand five hundred feet of lumber was sawed and piled and 45,000 shingles were sawed and packed.

Telephones.—During the year the telephone line was extended from the Logging Creek ranger station to the Wilson Creek ranger station, a distance of 15 miles, and 6 miles of new line were constructed connecting the North Fork ranger station with the main line. There are now 118 miles of telephone line owned by the Government within the Glacier National Park.

CONCESSIONS.

The following concessions have been granted since January 1, 1915, and expire December 31, 1915:

Concessions for year 1915.

John Weightman, stage	$120.00
Ada M. Swank, residence	50.00
G. N. Ry. Co., Y track	9.18
Miller & Kelly, boat	160 00
J. M. Gruber, residence	50 00
Howard Eaton, saddle and pack and 3 wagons	55 00
Glacier Park Hotel Co., camp sites	1,090 00
J. F. Lindhe, saddle and pack	15 00
Glacier Park Hotel Co., news stands	250 00
John J. Walsh, pasture	5 00
Ski F. Keckler, saddle and pack	15.00
Frank Fair, saddle and pack	25.00
G. N. Ry. Co., back filling and borrow pits	47.17
Dee Corlett, saddle and pack	15.90
Wm. P. Dawson, saddle and pack	15.00
F. M. Bagley, saddle and pack	20.00
S. R. Franklin, saddle and pack	9.00
Park Saddle Horse Co., saddle and pack	300.00
Josiah Rogers, saddle and pack	100.00
Steve Elkins, saddle and pack	24.88
Thos. Dawson, saddle and pack	25.00
Frank Higgins, saddle and pack	25.00
Wm. C. Gird, saddle and pack	12.00
Malcolm Clark, saddle and pack	15.00
T. J. Sullivan, saddle and pack	17.90
Helen P. Clarke, saddle and pack	25.00
Glacier Park Hotel Co., boat	90.00
S. R. Franklin, saddle and pack	12.00
Automobile permits, June 1, 1915, to Oct. 1, 1915	448.00
Total receipts to October 1, 1915	3,046.03

VISITORS.

From June 1, 1915, to October 1, 1915, there were 13,465 visitors registered at the two main entrances to the park, Glacier Park and Belton. It is estimated quite conservatively that 800 people entered the park at points where there are no stations and failed to register, making a total of 14,265 visitors.

Visitors by different entrances.

Belton, western entrance	6,434	Glacier Park entrance	7,031

The following shows registration by States and Territories of the United States, and foreign lands:

Visitors by States.

Alabama	12	Delaware	3
Arizona	8	District of Columbia	129
Arkansas	30	Florida	15
California	221	Georgia	22
Colorado	84	Idaho	66
Connecticut	66	Illinois	1,041

Indiana	291	North Carolina	18
Iowa	507	North Dakota	377
Kansas	280	Ohio	285
Kentucky	57	Oklahoma	65
Louisiana	17	Oregon	66
Maine	34	Pennsylvania	457
Maryland	70	Rhode Island	45
Massachusetts	227	South Carolina	31
Michigan	183	South Dakota	65
Minnesota	1,000	Tennessee	38
Mississippi	14	Texas	290
Missouri	617	Utah	15
Montana	4,085	Virginia	35
Nebraska	416	Vermont	23
Nevada	1	Washington	497
New Hampshire	32	Wisconsin	248
New Jersey	151	West Virginia	128
New Mexico	10	Wyoming	37
New York	929	Alaska and island possessions	11

Foreign countries.

Argentina	2	Italy	1
Australia	2	Japan	3
Canada	71	Mexico	2
Central America	3	Peru	2
Cuba	2	South Africa	2
England	2	Switzerland	7
France	2	Uruguay	5
Germany	2		

The following number of persons were cared for at the various hotels and camps in the park:

Guests at camps of Glacier Park Hotel Co.

Two Medicine camp	335	Gunsight camp	1,018
Cut Bank camp	218	Sperry Chalet	639
St. Mary camp	986	Many-Glacier	6,115
Going-to-the-Sun	2,814	Granite Park	270

At the Glacier Hotel on Lake McDonald 7,381 tourists were accommodated during the season, 2,154 of whom remained three days or more.

One hundred and sixteen camping parties toured the park for trips of three days or more.

FISH.

Sixty-three cans of fish have been put in the lakes and streams of the Glacier National Park during the past year, and more will be received during October.

WILD ANIMALS.

Conditions for game during the past winter were excellent. There was an unusually light fall of snow for this section and the winter was very mild, and as a result the game in the park wintered in excellent condition.

Deer.—Both the blacktail and the whitetail are found in large numbers, and it is estimated that there are at least 10,000 in the park.

Elk.—While the greater number of elk range on Park, Ole, and Nyack Creeks, small herds are found in almost every section of the park, and the latest estimates place their number at 600.

Moose.—It is estimated that there are 80 moose in the park, the most of which are to be found in the valley of the North Fork of the Flathead River.

Sheep and goats.—The bighorn sheep and the Rocky Mountain goat are found principally along the main range and on the eastern slopes of the Rockies. The sheep are becoming quite tame, and many photographs have been taken of small bands during the past year, which were taken at a distance of 50 feet or under.

Bear.—There are three varieties, which abound in considerable numbers throughout the park, the grizzly, the brown or cinnamon, and the common black.

Predatory animals.—There are a few wolves along the eastern border of the park and the coyote abounds in large numbers throughout the park. They are the principal menace to the animal life. Their numbers are kept down to some extent by the regular park ranger force and by the settlers in the park. Some are caught in traps, but the principal method of extermination is by the use of strychnine. A few mountain lion are also found in the park.

Fur-bearing animals.—Large numbers of weasel, marten, mink, and some lynx are found throughout the wooded sections. They are very destructive to the wild fowl and bird life. Colonies of beaver are to be found on almost every stream in the park.

Wild fowls and birds.—Grouse of the blue, ruffed, and pin-tailed varieties are found in the park, and there are a few ptarmigan in the higher altitudes. Many duck and some geese nest in the park and several varieties of small birds are found.

Game protection.—Three arrests were made during the year for game poaching. The parties were taken before the United States commissioner, two pleading guilty and were fined, but after an examination the third party was discharged.

MISDEMEANORS.

There was one arrest made for assault in the park during the year. The defendant pleaded guilty to the charges and was fined $5 and costs, amounting in all to $15.75.

RECOMMENDATIONS.

I earnestly recommend the construction of an independent telephone system for the park service. The telephone lines in the park east of the Continental Divide are owned by the Glacier Park Hotel Co., and are not connected with the park system on the west side of the park. Under the present conditions when it is necessary to send a message to any point in the park east of the main range it has to be telegraphed to Glacier Park station and sent out over the telephone line from that place to its destination. During the season just closed the Glacier Park Hotel Co.'s telephone lines have been poorly maintained and as a result a great many times it has been impossible to transmit or receive messages of importance.

I urgently recommend that a road be built from the foot to the head of Lake McDonald. This would facilitate the travel to the head of the lake and would be the first link in building the Waterton-Lake McDonald road or in building a road across either Gunsight or Logan Pass. In the future development of the park a road from east to west, through one of the passes, will be a necessity. It will afford quick and easy transportation to hundreds of tourists who will not undergo the hardships of a horseback trip, and would open up a new and scenic transcontinental route for automobiles, a constant procession of which would traverse this route during the summer months. Such a road would not only afford a vastly increased number of people the opportunity of seeing the park but would greatly increase the revenues of the park.

The unusually wet weather of the past season has made it apparent to anyone familiar with the conditions that the roads build of native soil will not stand heavy traffic in wet weather, and in consideration of this fact I most emphatically recommend that the roads over which the park service has control be well surfaced with gravel or with crushed rock in order that travel may be safe and dependable the entire season regardless of wet conditions.

Very respectfully,

S. F. RALSTON,
Supervisor.

The SECRETARY OF THE INTERIOR.

APPENDIX.

RULES AND REGULATIONS.

Regulations of May 13, 1914.

The following rules and regulations for the government of the Glacier National Park are hereby established and made public, pursuant to authority conferred by the act of Congress approved May 11, 1910:

1. It is forbidden to injure or disturb in any manner any of the mineral deposits, natural curiosities, or wonders on the Government lands within the park.

2. It is forbidden to cut, without a permit from the Secretary of the Interior or his authorized representative, any timber growing on the park lands; it is also forbidden to injure any growing timber or deface or injure any Government property. Camping parties will be allowed to use dead or fallen timber for fuel. When felling timber, stumps must not be left higher than 12 inches from the ground.

3. Fires should be lighted only when necessary and completely extinguished when not longer required. The utmost care must be exercised at all times to avoid setting fire to the timber and grass.

4. Hunting or killing, wounding, or capturing any bird or wild animal on the park lands, except dangerous animals when necessary to prevent them from destroying life or inflicting an injury, is prohibited. The outfits, including guns, traps, teams, horses, or means of transportation used by persons engaged in hunting, killing, trapping, ensnaring, or capturing such birds or wild animals, or in possession of game killed on the park lands under other circumstances than prescribed above, will be taken up by the superintendent and held subject to the order of the Secretary of the Interior, except in cases where it is shown by satisfactory evidence that the outfit is not the property of the person or persons violating this regulation and the actual owner thereof was not a party to such violation. Firearms will only be permitted in the park on written permission from the superintendent thereof. On arrival at the first station of the park guard, parties having firearms, traps, nets, seines, or explosives will turn them over to the officer in charge of the station, taking his receipt for them. They will be returned to the owners on leaving the park.

5. Fishing with nets, seines, traps, or by the use of drugs or explosives, or in any other way than with hook and line, is prohibited. Fishing for purposes of merchandise or profit is forbidden. Fishing may be prohibited by order of the superintendent in any of the waters of the park, or limited therein to any specified season of the year, until otherwise ordered by the Secretary of the Interior.

All fish less than 8 inches in length should at once be returned to the water with the least damage possible to the fish. Fish that are to be retained must be at once killed by a blow on the back of the head or by thrusting a knife or other sharp instrument into the head. No person shall catch more than 20 fish in one day.

6. No person will be permitted to reside permanently, engage in any business, or erect buildings, etc., upon the Government lands in the park without permission, in writing, from the Secretary of the Interior. The superintendent may grant authority to competent persons to act as guides and revoke the same in his discretion. No pack trains will be allowed in the park unless in charge of a duly registered guide.

7. Owners of patented lands within the park limits are entitled to the full use and enjoyment thereof; the boundaries of such lands, however, must be determined, and marked and defined, so that they may be readily distinguished from the park lands. While no limitations or conditions are imposed upon the use of such private lands so long as such use does not interfere with or injure the park, private owners must provide against trespass by their stock or cattle, or otherwise, upon the park lands, and all trespasses committed will be punished to the full extent of the law. Stock may be taken over the park lands to patented private lands with the written permission and under the supervision of the superintendent, but such permission and supervision are not required when access to such private lands is had wholly over roads or lands not owned or controlled by the United States.

8. Allowing the running at large, herding, or grazing of cattle or stock of any kind on the Government lands in the park, as well as the driving of such stock or cattle over the same, is strictly forbidden, except where authority therefor has been granted by the superintendent. All cattle or stock found trespassing on the park lands will be impounded and disposed of as directed in regulations approved May 13, 1914.

9. No drinking saloon or barroom will be permitted upon Government lands in the park.

10. Private notices or advertisements shall not be posted or displayed on the Government lands within the reservation, except such as may be necessary for the convenience and guidance of the public.

11. It is forbidden to carve or write names or otherwise deface any of the posts, signboards, platforms, seats, railings, steps, bowlders, trees, or structures of any kind in the park.

12. Persons who render themselves obnoxious by disorderly conduct or bad behavior, or who may violate any of the foregoing rules, will be summarily removed from the park and will not be allowed to return without permission, in writing, from the Secretary of the Interior or the superintendent of the park.

No lessee or licensee shall retain in his employ any person whose presence in the park shall be deemed and declared by the superintendent to be subversive of the good order and management of the reservation.

13. The superintendent designated by the Secretary is hereby authorized and directed to remove all trespassers from the Government lands in the park and enforce these rules and regulations and all the provisions of the act of Congress aforesaid.

Instructions of May 13, 1914.

1. Interference with or molestation of any wild animal, bird, or bird's nest on the Government lands in the park in any way by any person not authorized by the superintendent is prohibited.

2. The wanton destruction of wild flowers, plants, or shrubs growing on the Government lands in the park is forbidden.

3. *Fires.*—The greatest care must be exercised to insure the complete extinction of all camp fires before they are abandoned. All ashes and unburned bits of wood must, when practicable, be thoroughly soaked with water. Where fires are built in the neighborhood of decayed logs, particular attention must be directed to the extinguishment of fires in the decaying mold. Fire may be extinguished where water is not available by a complete covering of earth, well packed down. Care should be taken that no lighted match, cigar, or cigarette is dropped in any grass, twigs, leaves, or tree mold.

4. *Camps.*—In selecting a camping ground its location should be sufficiently distant from the water source, stream, or spring as not to be objectionable to those who may wish to camp in the vicinity and use the same water source at the same time. Blankets, clothing, hammocks, or any other article liable to frighten teams must not be hung near the roads or trails.

The cutting of green timber or boughs for bough beds is strictly prohibited. All dry poles used as tent poles must be neatly stacked upon breaking camp.

Camp grounds must be kept in sanitary and neat condition at all times, and upon their abandonment all kitchen refuse, cast-off wearing apparel, tin cans, paper boxes, etc., must be deposited in a pit provided for the purpose. When camps are made at unusual places where pits may not be provided, all refuse must be hidden where it will not be offensive, to the end that the site will be suitable for use by future campers.

When a party is accompanied by a licensed concessionaire or his representative, such concessionaire or representative will be held accountable for any violations of these rules.

5. *Fishing.*—See Rule No. 5.

6. *Dogs and cats.*—Cats are not permitted on the Government lands in the park, and dogs only to those persons passing through the park to the territory beyond, in which instances they must be kept tied while crossing the park. This rule does not apply to trained dogs used by Government employees in extermination of pedatory wild animals.

7. *Dead animals.*—All domestic animals that may die on the Government lands in the park at any tourist camp or along any of the public thoroughfares must be immediately removed to a point not nearer than one-fourth mile from such camp or thoroughfare and there be buried at least 2 feet beneath the ground by the owner or person having charge of such animal.

8. *Driving on roads of park.*—(*a*) Drivers of vehicles of any description when overtaken by other vehicles traveling at a faster rate of speed shall, if requested to do so, turn out and give the latter free and unobstructed passageway.

(*b*) Vehicles in passing each other must give full half of the roadway. This applies to freight outfits as well as any other.

(*c*) Freight, baggage, and heavy camping outfits will take the outer side of the road when being passed by passenger vehicles in either direction.

(*d*) Transportation companies and all other parties and persons using the park roads will be held liable for violations of these instructions.

(*e*) Mounted men on meeting a passenger team on a grade will halt on the outer side until the team passes. When approaching a passenger team from the rear warning must be given, and no faster gait will be taken than is necessary to make the passage, and if on a grade the passage will be on the outer side. A passenger team must not be passed on a dangerous grade.

9. *Concessionaires.*—Saddle and pack concessionaires must furnish rain-proof "slickers" with each saddle and horse rented.

Automobiles, stages, or other vehicles engaged in the transportation of tourists must be provided with and carry rain-proof tops and side curtains ready for use. In no case will an outfitter be permitted to add extra seats nor to crowd the normal seating capacity of a passenger-carrying vehicle.

All passenger-carrying vehicles must be provided with cushioned seats with full upholstered backs, and with proper springs; be freshly painted before the opening of each season, and be kept neat and in first-class running order; each must bear the name of the concessionaire and route. Rain-proof lap robes must be carried.

All animals used as either saddle animals or pack animals and all equipment constituting such pack trains, or any other transportation equipment, including all horses or other power used in connection, shall be subject to inspection at any time by the superintendent or his representative, and, if found upon such inspection to be unsafe, unfit, or otherwise incapacitated for such service, he may, in his discretion, suspend the license for such pack train or other transportation equipment until such time as in his judgment such incapacity is remedied.

All wagons used in hauling heavy freight over the park roads must have tires not less than 4 inches in width. This order does not apply to express freight hauled in light spring wagons with single teams.

10. *Miscellaneous.*—Automobiles and motor cycles are permitted in this park under special regulations prescribed by the Secretary of the Interior.

It is forbidden to wash clothing or cooking utensils, or in any other way pollute the waters of the rivers and creeks of the park, or to bathe in any of the streams near the regularly traveled thoroughfares in the park without suitable bathing clothes.

It is forbidden to tie stock so as to permit their entering any of the streams of the park. All animals should be kept a sufficient distance from camping grounds not to litter the ground and make unfit for use the area which may be used later as tent sites.

Campers and all others, save those holding licenses from the Secretary of the Interior, are prohibited from hiring their horses, trappings, or vehicles to tourists or visitors in the park.

All complaints by tourists and others as to service, etc., rendered in the reservation should be made to the superintendent, in writing before the complainant leaves the park.

11. The penalty for disregard of these instructions is summary ejection from the park.

Regulations of May 13, 1914, governing the impounding and disposition of loose live stock.

Horses, cattle, or other domestic live stock running at large or being herded or grazed in the Glacier National Park, without authority from the Secretary of the Interior, will be taken up and impounded by the superintendent, who will at once give notice thereof to the owner, if known. If the owner is not known, notices of such impounding, giving a description of the animal or animals, with the brands thereon, will be posted in six public places inside the park and in two public places outside the park. Any owner of an animal thus impounded may, at any time before the sale thereof, reclaim the same upon proving ownership and paying the cost of notice and all expenses incident to the taking up and detention of such animal, including the cost of feeding and caring for the same. If any animal thus impounded shall not be reclaimed within 30 days from notice to the owner or from the date of posting notices, it shall be sold at public auction at such time and place as may be fixed by the superintendent after 10 days' notice, to be given by posting notices in six public places in the park and two public places outside the park, and by mailing to the owner, if known, a copy thereof.

All money received from the sale of such animals and remaining after the payment of all expenses incident to the taking up, impounding, and selling thereof, shall be carefully retained by the superintendent in a separate fund for a period of six months, during which time the net proceeds from the sale of any animal may be claimed by and paid to the owner upon the presentation of satisfactory proof of ownership, and if not so claimed within six months from the date of sale such proceeds shall be turned into the Glacier National Park fund.

The superintendent shall keep a record in which shall be set down a description of all animals impounded, giving the brands found on them, the date and locality of the taking up, the date of all notices and manner in which they were given, the date of sale, the name and address of the purchaser, the amount for which each animal was sold, and the cost incurred in connection therewith, and the disposition of the proceeds.

The superintendent will, in each instance, make every reasonable effort to ascertain the owner of animals impounded and to give actual notice thereof to such owner.

Regulations of March 30, 1912, governing the admission of automobiles and motor cycles.

Pursuant to authority conferred by the act of May 11, 1910, setting aside certain lands in the State of Montana as a public park, the following regulations governing the admission of automobiles into the Glacier National Park are hereby established and made public:

1. No automobiles will be permitted within the metes and bounds of the Glacier National Park unless the owner thereof secures a written permit from the superintendent or his representative.

2. Applications for permits must show: (*a*) Name of owner, (*b*) number of machine, (*c*) name of driver, and (*d*) inclusive dates for

which permit is desired, not exceeding one year, and be accompanied by a fee of $1 for a single round trip through the park, or a fee of $5 for each machine per annum.

Permits must be presented to the superintendent or his authorized representatives at the park entrance on the Government road. The permittee will not be allowed to do a transportation business in the park without a special license therefor from the Secretary of the Interior.

3. The use of automobiles will be permitted on the Government road from Belton, Mont., to the administrative headquarters at Lake McDonald between the hours of 7 a. m. and 8.30 p. m., but no automobile shall enter the park, or leave Lake McDonald in the direction of Belton, later than 8 p. m.

4. When teams, saddle horses, or pack trains approach, automobiles will take position on the outer edge of the roadway, regardless of the direction in which they are going, taking care that sufficient room is left on the inside for horses to pass.

5. Automobiles will stop when teams, saddle horses, or pack trains approach, and remain at rest until they have passed or until the drivers are satisfied regarding the safety of their horses.

6. Speed will be limited to 6 miles per hour, except on straight stretches where approaching teams, saddle horses, and pack trains will be visible, when, if none are in sight, this speed may be increased to the rate indicated on signboards along the road; in no event, however, shall it exceed 15 miles per hour.

7. Signal with horn will be given at or near every bend to announce to approaching drivers the proximity of a machine.

8. Horses have the right of way, and automobiles will be backed or otherwise handled, as necessary, so as to enable horses to pass with safety.

9. All permits granted at any time when automobiles can enter the park will expire on December 31 of the year of issue.

10. These rules are also applicable to motor cycles, which may use only the roads herein mentioned, on payment of a fee of $1 for each machine per annum; permits issued therefor shall expire on December 31 of the year of issue.

11. Violation of any of the foregoing rules, or the general regulations for the government of the park, will cause the revocation of permit; will subject the owner of the automobile or motor cycle to any damages occasioned thereby and to ejectment from the reservation, and be cause for refusal to issue a new permit to the owner without prior sanction in writing from the Secretary of the Interior.

EXCERPT FROM THE ACT MAKING APPROPRIATION FOR THE SUNDRY CIVIL EXPENSES OF THE GOVERNMENT FOR THE FISCAL YEAR ENDING JUNE 30, 1915, AND FOR OTHER PURPOSES, APPROVED AUGUST 1, 1914 (PUBLIC NO. 161).

For the administration and improvement of Glacier National Park, Montana, the construction of roads, trails, bridges, and telephone lines, and the repair thereof, including the construction of a road, together with the necessary bridges and culverts, from the old town of Saint Mary, thence in a general northerly and westerly direction through that part of the Blackfeet Indian Reservation east of Lower Saint Mary Lake to a point in or near section thirty-five

township thirty-six north, range fifteen west, on the boundary line between the Glacier National Park and the Blackfeet Indian Reservation, $75,000. The Secretary of the Interior is hereby authorized to accept patented lands or rights of way over patented lands in the Glacier National Park that may be donated for park purposes (acts May eleventh, nineteen hundred and ten, volume thirty-six, page three hundred and fifty-four, sections one, two; June twenty-third, nineteen hundred and thirteen, volume thirty-eight, page forty-nine, section seventeen).

EXCERPT FROM THE ACT MAKING APPROPRIATIONS FOR SUNDRY CIVIL EXPENSES OF THE GOVERNMENT FOR THE FISCAL YEAR ENDING JUNE 30, 1916, AND FOR OTHER PURPOSES, APPROVED MARCH 3, 1915 (PUBLIC NO. 263).

Glacier National Park, Montana: For administration and improvement, construction of roads, trails, bridges, and telephone lines and the repair thereof, including necessary repairs to the road from the old town of Saint Marys; through that part of the Blackfeet Indian Reservation east of lower Saint Marys Lake to a point in or near section thirty-five, township thirty-six north, range fifteen west, on the boundary line between the Glacier National Park and the Blackfeet Indian Reservation, authorized by the sundry civil act of August first, nineteen hundred and fourteen, $75,000. Also the Secretary of the Interior is authorized to spend out of the appropriation herein authorized for the repair of the road known as the Two Medicine Road, from the main automobile road to the boundary line between the Glacier National Park and the Blackfeet Indian Reservation, within the Blackfeet Indian Reservation, $1,000; and also, $1,000 for the repair of the Cut Bank Road, from the main automobile road to the boundary line between the Glacier National Park and the Blackfeet Indian Reservation, within the Blackfeet Indian Reservation. The Secretary of the Interior is authorized to accept patented lands or rights of way over patented lands in the Glacier National Park that may be donated for park purposes.

The Secretary of the Interior is authorized to expend from the appropriation for the administration and improvement of the Glacier National Park, provided for in the sundry civil act of August first, nineteen hundred and fourteen, the sum of $600, or so much thereof as may be necessary, in the improvement of the wooden bridge leading across the Middle Fork of the Flathead River, and connecting the Belton Road with the road into the park.

REPORT OF THE SUPERINTENDENT OF THE PLATT NATIONAL PARK.

REPORT OF THE SUPERINTENDENT OF PLATT NATIONAL PARK.

DEPARTMENT OF THE INTERIOR,
OFFICE OF SUPERINTENDENT,
PLATT NATIONAL PARK,
Sulphur, Okla., August 16, 1915.

SIR: I have the honor to submit the following annual report on the Platt National Park for 1915:

GENERAL STATEMENT.

By the acts of Congress of July 1, 1902 (32 Stat., 641), and April 21, 1904 (33 Stat., 220), 629.33 and 218.98 acres, respectively, at the town of Sulphur, Okla. (then Indian Territory), were segregated as the "Sulphur Springs Reservation," which designation, by joint resolution approved June 29, 1906, was changed to "Platt National Park."

The park, with a total area of 848.22 acres, extends in irregular form a distance of approximately 3 miles from northeast to southwest along Travertine Creek, including a portion of Rock Creek, into which the Travertine empties, and it has a circuit of 9 miles.

Within the park are a number of known mineral and three nonmineral springs, one of the latter (the Cold Spring) having been developed and confined during the fiscal year ended June 30, 1913. The principal groups of springs in the park are the Bromide and Medicine Springs in the extreme western portion of the park, the Beach, Pavilion, and Hillside Springs in the north central portion of the park, and the Bromide-Sulphur, Black Sulphur, and Wilson Springs in the south central part of the park. Sulphur springs predominate. The Antelope and Buffalo Springs, nonmineral in character, are situated at the extreme northeastern end of the park, with an elevation of 1,080 feet above sea level at the Antelope Spring and 1,078 feet at the Buffalo. They have an approximate discharge of 5,000,000 gallons daily into Travertine Creek, and are the source of this beautiful creek. The Medicine Spring was discovered within the last few years, and the work of confining the water of this spring and conveying it to the pavilion at Bromide Springs has been completed, although in a rather unsatisfactory manner, as the spring in its present condition fills up with every flood which comes down Rock Creek. This feature of this improvement has been exceptionally troublesome during the last few months of the fiscal year ended June 30, 1915, for the reason that Rock Creek was flooded by numerous heavy rains and the Medicine Spring was submerged by every flood, thus rendering the water unfit for use after every rain until the spring could be cleaned out.

VISITORS.

It is impossible to give an accurate account of the visitors to the Platt National Park during the year, for the reason that there is no way to determine the number. Visitors to the park all are domiciled in the city of Sulphur, some in hotels and boarding houses and others in private homes or rooming houses. Even if a correct register of the guests at the hotels and boarding houses could be obtained, there would still be guests at private homes and numbers of small rooming houses in the city who would not be numbered. However, I estimate that about 18,000 to 20,000 visitors came here last year.

There were registered in the park office a total of 569 persons who came into the park and camped for three days or more.

As shown by the records of the watchman at the Bromide Springs, the visitors there during the year just ended numbered 113,563, exceeding the attendance during the preceding year by 896. This aggregate number of visitors to this spring does not represent as many individuals, but is made up from day to day of visitors and resident citizens who make frequent trips to the springs.

During the year just ended 161 orders were issued from this office, on physician's prescriptions, for the shipment of the Bromide and Medicine waters in 5-gallon quantities to persons outside of the city. These shipments were made to various points in Oklahoma and Texas. There were also some shipments to Kansas, Arkansas, Chicago, Ill., and Brooklyn and New York City. There were shipped 5,205 gallons of Bromide water and 278 gallons of the Medicine water. During the entire year 54,430 gallons of these waters (including the water shipped) were taken from the springs. Out of this total, 34,971 gallons were Bromide and 13,976 gallons were Medicine. During a part of the season for visitors no orders were issued for shipment of these waters, as the supply was not sufficient to permit of its being carried from the springs.

LIVE STOCK CROSSING THE PARK.

Due to the fact that there are now no rangers in this park who could obtain information regarding the live stock crossing the park, no record has been kept of the number of cattle transported through same.

BUILDINGS AND THEIR CONDITION.

The following is a list of the buildings in the park, their location, condition, and the purposes for which they are used:

Frame cottage, 7 rooms, 2 halls, 3 porches (one sleeping porch), with servant's room attached. Located about 700 feet south of the Pavilion groups of springs. Recently repaired and in good condition. Used as a residence for the superintendent.

Frame cottage, 5 rooms, 1 hall, and 3 porches. Located about 450 feet due east of Panther Falls. Habitable. At present unoccupied.

Frame cottage, 6 rooms, 1 hall, 3 porches. Located approximately one-third mile so th of Pavilion Springs. Habitable but two porches need rebuilding, and roof recovered. At present occupied by Laborers W. K. and A. C. Milligan.

Frame cottage, 3 rooms, 1 pantry, and 1 porch. Located 10 rods north of Bromide Springs. Habitable, but needs new roof to entire building and the porch floor rebuilt; also a new flue. At present unoccupied, but will soon be occupied by Laborer W. K. Milligan.

Frame cottage, 5 rooms, 1 porch with cement floor. Located about 600 feet southeast of Pavilion Springs. In fairly good condition, but needs flues and roof repaired. At present unoccupied.

Stone building, 2 rooms, 1 porch, and coal shed attached, and with comfort station inside building with sewer attachments. Building recently repaired and renovated, and in good condition. Used as superintendent's office.

Frame pavilion at Bromide Springs, with stove room attached. In bad condition, crude construction, and should as soon as possible be replaced.

Two frame pavilions at Pavilion Springs. Both repaired and repainted a year ago.

Pavilion at Hillside Spring, conglomerate rock columns with pagoda roof and cement floor. Repainted a year ago and in good condition.

Pavilion at Black Sulphur Spring, frame. Repainted a year ago, and in serviceable condition.

Pavilion at Sulphur-Bromide Spring, frame. Repainted a year ago, and in serviceable condition.

Pavilion at Wilson Spring, frame. Repainted a year ago, but still in need of repairs, especially to roof.

Pavilion at artificial spring near old Vendome, frame. Repainted a year ago and roof replaced.

Ten frame resthouses in good condition.

Seven old resthouses in fair repair. Frame structures.

One resthouse, with sewer attachments at ranger house near superintendent's residence.

One new frame barn, with hayloft and buggy shed (the buggy shed with cement floor); also new tool shed with cement floor (the tool shed built during the fiscal year just ended), attached to barn. The whole structure recently painted and in excellent condition. Located immediately south of superintendent's residence.

One shed henhouse and one shed storeroom, both crudely constructed. Located, respectively, southeast and immediately east of superintendent's residence.

One frame storeroom, roughly constructed. Located immediately east of 5-room cottage, which is 600 feet southeast of Pavilion Springs.

One frame stable, small and crudely constructed. Located southeast of 5-room cottage, which is 600 feet southeast of Pavilion Springs.

One frame stable, roughly constructed. Located just east of ranger house, which is due east of Panther Falls.

One frame barn, new and in good condition. Rebuilt recently from old barn which was blown down by storm on May 6, 1915. Located just west of residence occupied by Laborers W. K. and A. C. Milligan.

One small frame crib, crudely constructed. Located just northwest of residence occupied by Laborers A. C. and W. K. Milligan.

Frame poultry house, crudely constructed. Located northwest of 3-room cottage near Bromide Springs.

One small frame barn, crudely constructed. Located just west of 3-room cottage near Bromide Springs.

One small frame tool house and comfort station combined. In good condition and located southwest of superintendent's office.

OFFICIAL VISITS.

In November, 1914, General Supt. Mark Daniels came here and made a thorough inspection of the park, familiarized himself with the conditions, and made suggestions for its improvement and maintenance which have been of great benefit to me in its administration.

ROADS.

Under date of October 26, 1914, the department made an allotment of $1,000 for the construction of a new road from Lincoln Bridge along the north bank of Rock Creek to connect the Travertine Road with the road at Bromide Springs. The work of actual construction on this road was commenced on February 24 and completed on May

27, 1915, the entire cost amounting to only $792.27, the amount expended for labor alone being $775.99. The unexpended balance of the $1,000 allotment was transferred to the unallotted funds and reallotted for other purposes.

The character of this road is the same as that built along Travertine Creek during the last fiscal year by Mr. E. A. Keys, viz, graded roadbed 18 feet wide between ditches, with a graveled surfacing or paved way 14 feet in width. The entire length of the new road is 5,906 feet, and it is graded with a 5-inch crown, and there is not over a 1 per cent grade on any part of it. It has nine cement culverts built at intervals along the road, which were deemed sufficient to properly care for the drainage. These culverts all have cylindrical openings, four of them with 12-inch openings and five with 18-inch openings, and all have square wing walls. There were 1,180 yards of gravel spread upon the entire road, the gravel used being the natural macadam which is found in abundance within the park.

During the month of June, 1915, repairs were made to the south part of Buckhorn Road, which leads south and southeast past Wilson Spring to the south line of the park and to the Bromide and Bromide-Sulphur Lanes. These repairs consisted of the proper grading and side ditching of these roads. The Buckhorn Lane was graded at the south end for a distance of 1,750 feet, the Bromide Lane for its entire length of 3,000 feet, and the Bromide-Sulphur Lane for its entire length of 2,200 feet, making a total of 6,950 feet of newly graded road. These roads have not yet been graveled, but this will be done during the early part of the next fiscal year, and there will then be within the park something like 7 or 8 miles of good driveway, which, if properly maintained, will be of a permanent nature.

REPAIRS TO BUILDINGS.

Allotment of $250 was made on October 26, 1914, for repairs to the superintendent's office, including painting of both exterior and interior woodwork, as well as the roof, repapering interior, rebuilding porch, and other minor improvements; but when the actual work was begun it was found that the allotment was not much more than sufficient to pay for the material required in the repairs to this building, hence it was necessary to draw on the miscellaneous emergencies and contingencies allotment in order to thoroughly renovate and repair this building.

I found some of the sills and all of the underpinning to this house decayed and these had to be replaced, and the old chimney which had been built so as to rest on the ceiling joists had to be torn out and a new one put in its place. The old one had for a number of years been propped up with a piece of timber set up in the middle of the house, and I had the new chimney set on a stone foundation built from the ground up and properly concealed within the walls of the building. The old porch around the office was entirely torn away and a new one built in its stead, and the roof was reshingled and painted. Inside the office was entirely done over, and all the woodwork (including the stationery cabinets and one long counter desk) was stained and grained in imitation oak, and then given a coat of varnish. The outside woodwork was all given two coats of good lead and oil. The front room of the office was repapered and the back room finished with alabastine. The stone piers under the porch

had to be torn down and entirely rebuilt. The office now presents a very neat and attractive appearance and will serve very well for this park for some years to come.

The entire roof at the superintendent's residence was reshingled and painted, a small sleeping porch built, the house underpinned, and cement steps built on the south and west sides of the house. Some of the windows were repaired and new sash cords and weights were put in. A new 30-barrel galvanized water tank was also installed at this residence, the tank being 5 feet in diameter and 5½ feet in height.

During June of this year a new tool shed was constructed adjacent to the barn which was built in 1912 near the superintendent's residence. It was built much like the barn, size 20 by 24 feet, with cement floor and a ventilator on the roof. The new shed was given two coats of good lead and oil, and the old barn was given one good coat of paint, while the entire roof was painted with one coat of good roof paint. This tool shed not only furnishes an excellent place for the protection of the tools and implements belonging to the park, but also provides additional facilities for the storage of crops raised on the park for the use of the park team.

CAUSEWAY OVER ROCK CREEK NEAR CONEY ISLAND FORD.

A cement causeway 16 feet wide and 146 feet in length was built during June, 1915, across Rock Creek at the Coney Island ford to connect the new Bromide Road with the Travertine Road so that automobiles could easily ford the stream at this point. This causeway was heavily reinforced with reinforcing steel, wire fencing, and old iron bridge timbers, and a sidewalk 2 feet wide was tied to the upstream side of the causeway with heavy steel stirrups, which constitute the reinforcement to the stone piers to which the sidewalk is tied with pieces of steel. The sidewalk is also reinforced in the same way as the causeway, and altogether there were 330 sacks of cement used in the construction of this improvement. The length of the sidewalk is 98 feet. Before putting down the cement floor of this causeway I had the ford filled with a quantity of good sharp rocks as a foundation, and the cement was poured into these rocks, and after the causeway was completed I had it riprapped at both ends to prevent heavy flood waters from undermining it.

The total cost of this causeway was $440.46, exceeding the allotment of $370, which was made for this purpose, because of the fact that I found it necessary to increase the length of both the causeway and the sidewalk over the estimated length, thus necessarily increasing the actual cost of construction.

This causeway had been built only halfway across the stream when one of the highest flood waters we have had on this creek for 20 years occurred and huge pieces of driftwood floated over it without disturbing the completed portion of the work, and since the completion of this improvement two other heavy flood waters have passed over the causeway without having damaged it.

I consider this method of crossing small streams in the national parks an improvement over bridge building, in view of the fact that it is less expensive and more picturesque, and at the same time provides a means of crossing for pedestrians equal to a bridge.

GENERAL IMPROVEMENTS.

An ornamental lawn fence was placed around the superintendent's residence, the fence being 330 feet around, with finished bois d'arc posts set in cement, and an iron gate, the whole having been given two coats of good paint.

On May 6, 1915, a heavy windstorm blew down a small barn near the teamster's residence, and about 40 trees in West Central Park, along the Bromide Trail, and around the superintendent's office, also along Travertine Road up to Sycamore Falls. The barn had to be rebuilt and the trees have most of them been cleared away, the timbered parts of them having been cut up into wood and the branches having been used for the purpose of filling washouts along the creek banks.

Nearly 200 young trees were planted in the park during the year, and these have been watered when necessary. The most of them are growing nicely, but some in low places died during the continued wet weather in the spring.

RECOMMENDATIONS.

The following recommendations are submitted as indicating what it is necessary for Congress to provide for the maintenance and improvement of this park during the fiscal year ending June 30, 1917. Some of the improvements were suggested in my report for last year, but it was not possible to provide for all from the appropriation made for the fiscal year 1916, and as I consider them important I am repeating them in this report.

As mentioned in the early part of this report, the Medicine Spring is submerged by every flood water of Rock Creek, which renders the water of this spring unfit for use each time the creek rises until the spring can be cleaned out; and I have the honor to recommend that $500 be provided for improvement of this spring, the character of the proposed improvement to be a semicircular stone and cement wall (similar to the one now at the Bromide Spring) for the prevention of the overflow of this spring by the creek, the width, length, and height of the proposed wall to be 24 by 26 by 16 feet. The spring itself should be confined within an inclosure constructed of cement, with manhole cover so that it could be cleaned out occasionally. This inclosure should be about 80 feet square.

I also again recommend the erection of a new pavilion along the Bromide Cliff, which will embrace both the Medicine and Bromide Springs, in accordance with a report submitted to the department in September of 1913, by Inspector M. L. Dorr. The building should be constructed so as to conform as nearly as possible to the contours of the cliff side, against which it would have to be built, and should be composed of one long room with glass front, opening out onto a balcony which would overhang the creek, and which might be supported by native conglomerate columns. The glass front should be so arranged that it could be closed in winter and opened in summer, and a heating system and coal house might be installed underneath. The dimensions of this building would be about as follows: Twelve feet wide, 222 feet long, and 9 feet high, with an 8-foot porch and an

ornamental cupola to break the length of the building and to hold a flagpole. The probable cost of the labor in erecting this building would be about $900. The total cost would be about $3,000. I recommend that this amount be appropriated for the erection of this structure.

The Beach Springs (3 in number), located just north of the Coney Island ford, like the Medicine Spring, are submerged with every flood stage of Rock Creek, and as these waters are preferred by many visitors to the park, I feel that the springs should be improved and a pavilion erected over them. I recommend that the proposed improvement to the springs consist of a large inverted funnel-shaped inclosure, confining the three springs so as to make a combined flow of the three springs from one outlet—the funnel to be constructed of galvanized iron, over which a cement covering should be laid—the approximate measurement of the proposed inclosure to be 600 square feet. Surrounding this inclosure to the springs proper should be built a square inclosure to prevent overflow of these springs by the creek. This second inclosure should be about 6 feet high at the creek edge and should bed back into the hill, the depth of the side walls gradually decreasing as the hill rises, but the top of the wall should remain level with the wall along the creek's edge. The approximate length of the entire wall is 540 square feet.

On the bottom of the outer inclosure should be laid a cement floor, rising with the hill in a succession of 4-foot steps with 6-inch risers, the approximate surface feet of this floor measuring about 720 feet.

On the top of the outer inclosure to this group of springs, supported by conglomerate columns, should be erected a pavilion, size 24 by 30 by 9 feet, with pagoda roof supporting a flag pole. The probable cost of labor on this entire improvement, including the pavilion, would be approximately $410, with a total cost of $1,000, and I recommend that the department ask Congress for an appropriation to cover this cost.

In my last annual report I also recommended a bridge, to be located immediately south of these springs, the other end to be located near the flush tank for the main line of the sewer, but since the building of the causeway at Coney Island ford, with the sidewalk attached, this bridge is not an essential improvement.

As there will be something near 7 or 8 miles of roads in the park when I have finished graveling the roads in the south part of the park, I estimate that it will require about $750 to properly maintain them during the next fiscal year. Out of this there will probably be expended about $720 for labor and $30 for tools and materials. The character of the repairs to be made would be the filling of chuck holes, regraveling where surfacing has worn off, sprinkling roads to prevent surfacing from blowing off with the high winds, and grading and dragging roads.

I recommend that $400 be set aside for the purpose of exterminating weeds on about 300 acres of the park most frequented and clearing out underbrush on approximately 300 acres. This would likely include the small parks at Bromide Springs, Cold Springs, East and West Central Parks, around the Pavilion Springs, the superintendent's office and residence, and along the creek banks. The probable cost of labor for these purposes would likely be about $375, and for tools and material about $25.

I desire to build a swimming pool in Travertine Creek by building a cement dam at a location near Panther Falls, where there is naturally a deep hole, which would require but little excavation. The probable size of this pool would be about 20 by 300 feet by 2 to 6 feet deep. Last year I estimated that this pool would cost about $150, but after looking more carefully into this proposition I am sure that $250 would more likely cover the cost of building such a pool as I have in mind, the character of the construction to be a cement dam on the downstream end of the pool, the upstream end of the pool to be of natural formation (travertine rock), the dam to be 6 feet deep, 4 feet thick, by 20 feet in length. The probable cost of labor in building this dam and making the excavation necessary would be about $120, while the cement and other material would likely cost as much as $130.

Recommendations are also made for the following regular maintenance expenses:

Salaries of regular park force, as follows:	
Superintendent	$1,500
Clerk-stenographer to superintendent	1,000
3 laborers—1 at $600, 1 at $480, and 1 at $300	1,380
On account of annual compensation of $3,600 to general superintendent of national parks	100
On account of annual compensation of $2,400 to assistant to general superintendent of national parks	100
On account of traveling and other expenses of assistant to the Secretary of the Interior or other department representative and of the general superintendent of national parks or his assistant	200
On account of annual rental of office quarters of general superintendent of national parks, San Francisco, of $1,200	100
For post-office box rent	3
For electric-light service in West Central Park, the pavilions and bridges, as well as the superintendent's residence and office, and for the purchase of electric-light globes	130
For telephone service in the superintendent's office	30
For shoeing park team and repairs to wagon, implements, harness, tools, etc	50
For fuel for the superintendent's office and residence and Bromide Springs pavilion	60
For planting and harvesting crops for use of park team	100
For miscellaneous, emergencies, and contingencies	500

In my last annual report I recommended that leases be granted for bathhouses in the park, or that they be built, maintained, and operated by the Government as sources of revenue. After a year I realize more forcibly than ever the extreme necessity for bathhouses in this park, and I feel that they should be owned and operated by the Government, in preference to granting leases to private individuals or corporations, and I recommend that the Government build one bathhouse during the next fiscal year, the estimated total cost of the building, including equipment, not to exceed $15,000. The supply of water for the bathhouse would be obtained by gravitation from the Hillside Spring, while the sewage would be emptied into the manhole of the flush tank on the south bank of Travertine Creek, which is a part of the siphon to line E of the park sewer system, and a distance of about 300 feet from the proposed location of the bathhouse. The material to be used in the construction of this building should be stone and brick, but it is impossible to give the size of the building or the itemized cost of material, labor, etc., without the assistance of an experienced architect.

I also recommend that Congress be asked to provide not to exceed $500 for the purchase of an automobile for use on this park by the superintendent in supervising the work, also for the purpose of showing visitors of note around over the park. At present there is no vehicle of any kind provided for the superintendent's use by the Government, and some provision should be made for a conveyance other than that provided by the superintendent from his own private funds.

SUMMARY.

Briefly, the appropriation asked for above will total $26,653, all of which could be expended advantageously during the year for which it is requested, and it should be provided as a whole if this park is to be properly maintained and improved. It is impossible to make much of a showing on a park the size of this one with the small appropriations that have heretofore been made for it; and I consider this park attractive enough naturally, and its waters sufficiently beneficial to "the ills the human flesh is heir to" for every effort on the part of our Government to be made toward making it a haven for the sick and a place of rest and pleasure for the well. I hope these recommendations will all be carefully considered and that they will be favorably acted upon.

I have the honor to be,
Respectfully,

R. A. SNEED,
Superintendent.

The SECRETARY OF THE INTERIOR,
Washington, D. C.

APPENDIX.

REGULATIONS OF JUNE 10, 1908.

Pursuant to the authority conferred by the acts of Congress approved July 1, 1902 (32 Stat., 656), April 21, 1904 (33 Stat., 220) and the Oklahoma statehood act of June 16, 1906 (34 Stat., 272), the following rules and regulations for the government of the Platt National Park (formerly Sulphur Springs Reservation), in Oklahoma, are hereby established and made public:

1. It is forbidden to injure in any manner any of the springs, mineral deposits, or natural features within the park.

2. It is forbidden to cut or injure any timber or plants growing on the park lands, or to deface or injure any Government property.

3. No camping shall be permitted within 1,000 feet of any spring, nor upon any land except such as may be specifically designed for that purpose by the superintendent. Fires shall not be lighted except by the express permission of the superintendent; when so allowed, campers shall use only dead or fallen timber for fuel, and the utmost care must be exercised at all times to avoid setting fire to the timber and grass.

4. It is forbidden for any person to deposit garbage or refuse upon the park lands, except at places designated for that purpose by the superintendent, or to contaminate any of the springs or streams therein, or to divert or conduct the waters of such springs or streams from the natural or regular course.

5. No person shall remove from any of the bromide, iron, or soda springs more than 1 gallon of water in any one day, nor remove from any of the other springs more than 5 gallons in any one day, nor shall any water be taken therefrom for commercial purposes, except in pursuance of a license issued by the Secretary of the Interior. Whenever in his judgment the circumstances warrant, the superintendent may prohibit the use of the waters of any of the springs in the park other than for immediate drinking purposes at such springs, the facts in such case to be reported to the Secretary of the Interior.

6. Hunting or killing, wounding or capturing any bird or wild animal on the park lands, except dangerous animals when necessary to prevent them from destroying life or inflicting an injury, is prohibited. The outfits, including guns, traps, teams, horses, or means of transportation used by persons engaged in hunting, killing, trapping, ensnaring, or capturing such birds or wild animals, or in possession of game killed on the park lands under other circumstances than prescribed above, will be taken up by the superintendent and held subject to the order of the Secretary of the Interior, except in cases where it is shown by satisfactory evidence that the outfit is not the property of the person or persons violating this regulation and

the actual owner thereof was not a party to such violation. Firearms will only be permitted in the park on written permission from the superintendent thereof.

7. Fishing with nets, seines, traps, or by the use of drugs or explosives, or in any other way than with hook and line, is prohibited. Fishing for purposes of merchandise or profit is forbidden. Fishing may be prohibited by order of the superintendent in any of the waters of the park, or limited therein to any specified season of the year, until otherwise ordered by the Secretary of the Interior.

8. No person will be permitted to reside permanently, engage in any business, or erect buildings or other improvements in the park, without permission, in writing, from the Secretary of the Interior.

9. The herding, grazing, or otherwise trespassing of cattle or loose stock of any kind within the park is strictly forbidden. Stock or cattle may be driven across the park, but must be confined to the roads and kept in motion under competent care while in the reservation.

10. No vehicles will be permitted to travel through the park except upon the roads designated for such traffic by the superintendent, and driving or riding over roads or bridges at a high rate of speed is prohibited.

11. Private notices or advertisements shall not be posted or displayed within the park, except such as may be necessary for the convenience and guidance of the public.

12. The sale of intoxicating liquors in the park is strictly forbidden.

13. No gambling or game of chance shall be permitted within the limits of the park; nor shall any person use profane or obscene language, commit or maintain a nuisance, or be guilty of disorderly conduct or any act involving immorality therein.

14. Persons who render themselves obnoxious by disorderly conduct or bad behavior, or who violate any of the foregoing rules, will be summarily removed from the park and will not be allowed to return without permission, in writing, from the Secretary of the Interior or the superintendent of the park.

No lessee or licensee shall retain in his employ any person whose presence in the park shall be deemed and declared by the superintendent to be subversive of the good order and management of the reservation.

15. Any person who violates any of the foregoing regulations will be deemed guilty of a misdemeanor, and be subjected to a fine, as provided by the act of April 21, 1904, of not less than $5 nor more than $100, and may be imprisoned for a term of not more than six months for each offense.

REGULATIONS OF JUNE 1, 1915, GOVERNING THE ADMISSION OF AUTOMOBILES AND MOTORCYCLES.

Pursuant to authority conferred by the acts of July 1, 1902 (32 Stat., 641), and April 21, 1904 (33 Stat., 220), setting aside certain lands in the State of Oklahoma as a public park, the following regulations governing the admission of automobiles and motorcycles into the Platt National Park are hereby established and made public.

1. No automobile or motorcycle will be permitted within the metes and bounds of the Platt National Park unless the owner thereof

secures a written permit from the superintendent of the park, at Sulphur, Okla., or his representative.

2. Applications for permits must show: (*a*) Name of owner, (*b*) number of machine, (*c*) name of driver, and (*d*) inclusive dates for which permit is desired, not exceeding one year, and be accompanied by a fee of $1 for each automobile or motorcycle. The permittee will not be allowed to do a transportation business in the park without a special license therefor from the Secretary of the Interior.

3. Speed will be limited to 15 miles per hour in all parts of the park, but this speed must be reduced to not exceeding 10 miles per hour when crossing intersecting roads and making sharp turns.

4. Signals with horn will be given at or near every bend to announce to approaching drivers the proximity of a machine.

5. Horses have the right of way, and automobiles or motorcycles will be backed or otherwise handled as necessary, so as to enable horses to pass with safety.

6. All permits granted at any time when automobiles or motorcycles can enter the park will expire on December 31 of the year of issue.

7. Violation of any of the foregoing rules, or the general regulations for the government of the park, will cause the revocation of permit; will subject the owner of the automobile or motorcycle to any damages occasioned thereby and to ejectment from the reservation; and be cause for refusal to issue a new permit to the owner without prior sanction in writing from the Secretary of the Interior.

REPORT OF THE SUPERVISOR OF THE WIND CAVE NATIONAL PARK.

REPORT OF THE SUPERVISOR OF THE WIND CAVE NATIONAL PARK.

WIND CAVE, S. DAK., *August 7, 1915.*

SIR: I have the honor to transmit herewith the following report on the management of the Wind Cave National Park for the year ended June 30, 1915:

GENERAL STATEMENT.

The act of Congress approved January 9, 1903 (32 Stat., 765), made reservation of a tract of land in South Dakota, comprising 10,522 acres, to be known as the Wind Cave National Park. When this act was passed there were several tracts of patented lands within the boundary, but the Government has secured title to all such lands, and at the present date the boundaries of the park embrace no lands that are not under the exclusive control of the Government.

The park is almost square and has an area of approximately 16 square miles. It is located in a semimountainous region on the southern slopes of the Black Hills, in the southwestern corner of the State of South Dakota, about 36 miles from the southern boundary and 24 miles from the Wyoming line. The altitude is 4,030 feet at headquarters. Portions of the mountains west of the cave attain an altitude of 4,700 feet.

The park is under direct control of a supervisor—the only official upon a regular salary. One or two guides serve during the summer months. There is also a park ranger for a month at a time to assist with grazing and timber matters.

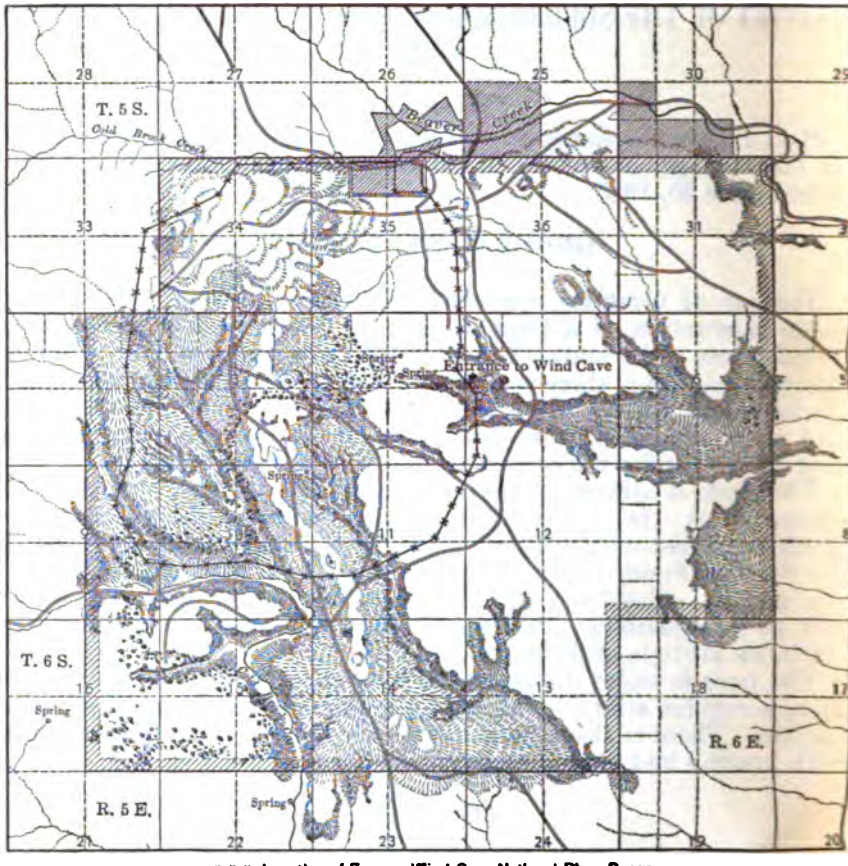
THE CAVE.

The chief attraction is the cave, situated somewhat north of the center of the park and about 12 miles north of the town of Hot Springs, which is the most accessible town of any importance. Headquarters for the park is maintained in close vicinity to the cave. Both the Burlington and the Chicago & North Western have regular train service with east and west connections to Hot Springs, and the majority of the visitors to the park come from this town. Mail and express matter comes to the park by way of Hot Springs.

The cave has been made accessible to the public by the working out of the passageways so as to admit of easy travel. It has also been necessary to construct a number of stairways, landings, bridges, and railings within the interior. The lower levels to which the public is conducted are possibly 480 feet below the surface entrance, and the total approximate linear distance of all accessible routes is not over 3 miles.

There is a spring and miniature lake in one place, and aside from this the cave is without water or moisture, except from condensation

of a heavily laden air. In this way moisture gathers on the ceilings of some caverns and drops to the floors, causing wet spots, but in very few places. The predominating formations are of limestone,



and visitors derive considerable satisfaction from viewing the calcite crystals, exposed geodes, box-work forms, and innumerable other beautiful formations.

WORK OF THE YEAR.

During the fiscal year the work performed under the supervision of my predecessor and myself can be briefly stated as follows:

The building for the use of the public as a waiting and registration building has been completed.

Repairing of stairways within the cave and the building of new stairs and landings where necessery.

Building of an ice house, size 12 by 12 feet, 10 feet high.

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Five miles of road was reshaped and smoothed, about one-half mile of which was made new in the process of straightening.

An underground reservoir of masonry 1 foot thick, with capacity of 450 barrels, was built and connected to a new sanitary drinking fountain near public building and the former hydrants and outlets in yard and residence. None but galvanized pipe was used in this system, and all conductor pipe was placed to a depth of 4 feet. The pipe is gradually reduced from 2 inches at outlet of reservoir to three-fourths inch at hydrants. The new reservoir is located 70 feet above and 300 feet distant from the park residence.

Screen doors and windows have been put on the public building and board fence adjoining same has been painted to conform with the color of the building.

The water pipe which was laid from the yard of the residence to pasture across road last year became clogged through freezing and burst, and was taken up. I considered it impracticable to use half-inch pipe and have substituted therefor some eave trough and spouting which was here, to conduct the waste water from drinking fountain to trough in pasture during the summer months.

The supervisor's office and all the rest of the rooms of the residence have been painted and porch and window screen repaired and painted.

Various other work of minor importance has been performed.

BUILDINGS.

The buildings are in a good state of repair except the supervisor's residence, the upstairs portion of which is still unfinished. It contains six rooms and is substantially constructed of stone obtained from within the park.

Other buildings in the park are as follows:

One building for registration and use of public visitors, containing three rooms.

One small, rectangular, open pavilion to provide shade was built expressly for the use of tourists who come from long distances and who necessarily have to stop at headquarters and lunch in order to take time to see the cave.

A small frame house over the entrance to the cave.

A good barn, with room for 5 head of horses, hay loft, and carriage room.

A small log tool house and blacksmith shop combined.

An ice house, size 12 by 12 by 10 feet.

The pavilion, public building, and ice house are new; the supervisor's residence and barn are but a few years old, and all are in good condition.

WATER SUPPLY.

The source of water supply is a spring about one-half mile west of and 150 feet higher than the park residence. The old pipe line from the spring to the new reservoir is still used. It is of three-fourth-inch galvanized pipe, and unless too near the surface in some places to afford protection from frost in winter will suffice for some years.

The capacity of spring is now about 40 barrels a day, though after a long period of excessively dry weather it has run as low as 4 barrels a day, the least it has been known to produce since its discovery. Having repaired the old tank, which holds 350 barrels, and connected same to new system, we now have storage for about 800 barrels of water, which, with the varying capacity of the spring, assures the park ample for all needs and a reasonable degree of protection from fire for the buildings.

ROADS AND BRIDGES.

There is but one main road through the park, extending from the north to the south, about through the center and passing headquarters. From the regions south and east this is the route to all of the Black Hills country and to much country in Wyoming and Montana. This road is of dirt and was before the heavy rains in June the best stretch of road between Custer and Hot Springs, but is at present in need of repair, which is now being done. The road both north and south of park limits has recently been greatly improved for a distance of 20 miles either way, and the increase of automobile travel as a result is very marked. The traffic is mostly by automobile and is increasing rapidly. Many parties that go through are bound for the many places of interest in the mountain regions to the north and have camp equipage packed in their cars.

In addition to this through automobile traffic, visitors to the cave are brought to the park from Hot Springs principally by automobile. Owners of cars desiring to bring visitors to the cave are required to take out a license for that purpose. At present nine automobiles are in use for that purpose.

The spring and summer season has been so cold and the weather so excessively rainy that so far this year there has been a much lighter attendance to the cave and the Hot Springs resort than usual.

VISITORS.

For the year ended June 30, 1915, the total number of registered visitors to the cave was 2,817. Of these 2,060 came during the three summer months—July and August of 1914 and June of 1915. It is the custom for an authorized guide (or guides) to conduct these visitors through the cave during these summer months, and as a trip therein requires about three hours but two trips each day are undertaken. The established time for entrance to the cave is at 9 o'clock in the morning and 2 o'clock in the afternoon. Each visitor pays a fee of 50 cents for entrance, and these fees are remitted to the department, the guides being upon a salary basis during the months of most attendance.

Many camping parties pass through the park with team and wagon, but on account of the lack of running water and scarcity of dead wood these people stop along the northern boundary and are not strictly within the park. It has been the custom not to encourage this class of traffic to stay longer than necessary, on account of the danger of fires. There is no record of campers who have stayed

within the park over 24 hours. The ordinary summer season is hot and dry, with much wind, and the danger from disastrous fires is very great.

MOVEMENT OF LIVE STOCK.

The movement of loose stock along the main road is not great. During the past year there has been but a few odd head of cattle taken through the park on the road. This stock belonged to local ranchmen who were changing their cattle from one range to another. Considerable stock is driven about the park, but on cross-country trips, without regard to the road.

TIMBER.

The western half of the park is covered with pine timber. The ordinary longleaf pine predominates, with some lodgepole pine interspersed. Some of this timber is approaching a size to be of commercial value. The timbered area of the park will stand for some forestry application and is worthy of more than passing notice.

STREAMS.

There is a running stream which skirts the northern boundary of the park for a distance of about a half mile, but in very dry seasons it ceases to flow. There is no other running stream within the park.

NATIONAL GAME PRESERVE.

A national game preserve has been established in the Wind Cave National Park under the provisions of "An act making appropriations for the Department of Agriculture for the fiscal year ending June 30, 1913," approved August 10, 1912 (37 Stat., 293), as follows:

> For the establishment of a national game preserve, to be known as the Wind Cave National Game Preserve, upon the land embraced within the boundaries of the Wind Cave National Park, in the State of South Dakota, for a permanent national range for a herd of buffalo to be presented to the United States by the American Bison Society, and for such other native American game animals as may be placed therein. The Secretary of Agriculture is authorized to acquire by purchase or condemnation such adjacent lands as may be necessary for the purpose of assuring an adequate, permanent water supply, and to enclose the said game preserve with a good and substantial fence and to erect thereon all necessary sheds and buildings for the proper care and maintenance of the said animals, $26,000, to be available until expended.

The establishment on this preserve of herds of bison, elk, and antelope has resulted in an added interest by the public in this park. It is particularly adapted to this purpose and the animals are doing well. The inclosure is about the western portion of the park and creates a pasture of about 4,000 acres.

Since it is impossible at times for the general public to obtain a glimpse of the game animals within this large pasture, there is a clamor for a smaller inclosure alongside the road, near the park headquarters, where some of the animals may be kept so visitors to the park can see them. The herds at present number 16 buffalo, 16 elk, and 11 antelope.

As a natural game reserve there is but the one animal, the white tail deer, that has come under the protection of the park. These are present in small numbers throughout the season, with more in the autumn season on account of the hunting to the northward, which drives them to the park for refuge.

The prairie sharp-tailed grouse and the bobwhite are present within the park in small numbers, and both are increasing and doing well. With the proper protection of these birds, which they are now getting, their rapid increase is assured.

The magpie, a most beautiful bird itself, is by far the worst enemy to bird propagation within the park. The magpie is migratory and is with us from late winter till July or until their young can fly well. While here they prey upon the young and eggs of other birds. This nuisance should be exterminated.

Coyotes and bobcats are common and an occasional gray wolf has been seen.

The worst local enemy to pine timber is the otherwise inoffensive porcupine, whose destructive work is evident here and there in the wooded area of the park.

CONCESSIONERS.

List of yearly permits authorized for transportation of passengers by automobile, Jan. 1, 1915, to Dec. 31, 1915, in the Wind Cave National Park.

Permit No.	Name of permittee.	Number of automobiles used.
1	H. Oldfield	1
2	A. L. Shannon	1
3	Bert Underhill	1
4	A. R. Peterson	1
5	W. R. Taylor	1
6	R. A. Hummel	1
7	Hot Springs Motor Co.	1
8	F. L. Hummel	1
9	J. R. Gofforth	1
10	Peterson Auto Co	1

Permits issued for the grazing of horses and cattle, using such of the park lands as are designated by the superintenednt thereof.

Permit No.	Name of permittee and rate exacted per head on horses and cattle.	Number grazed.	
		Horses.	Cattle.
1	H. H. Streeter, 56 cents per head on horses	25	.....
2	Paul E. Martin, 28 cents per head on horses	15	.....
3	Martin Valley Stock Co., 45 cents per head on cattle	.....	200
4	Geo. W. Brady, 28 cents per head on horses	12	.....
5	Geo. F. Clark, 56 cents per head on horses	4	.....
6	T. B. Quigley, 56 cents per head on horses	4	.....
7	Clark Bacon, 45 cents per head on cattle	.....	23
8	T. B. Quigley, 45 cents per head on cattle and 56 cents per head on horses	2	17
9	Smith Bros., 31 cents per head on cattle	.....	30

REVENUES.

The revenues for the fiscal year ended June 30, 1915, less transmission fees, aggregate $2,277.87, and were derived from the following sources:

Grazing permits	$344.82
Transportation licenses	608 95
Entrance fees (visitors to cave)	1,324.10
Total from all sources	2.277.87

RECOMMENDATIONS.

I submit for your consideration the following recommendations:

Charging of a license fee for the transportation of passengers to the cave should be abolished, as I think it would net a gain to the park revenues, reduce the expense to visitors, and be much more satisfactory to the public in general.

Almost without exception visitors to the cave assert that it ought to be lighted by electricity throughout, and many rail at our primitive system of lighting parties through. I recommend that $3,000 be provided for the installation of electric lights throughout the interior of the cave.

Two miles of game fence, inclosing about 300 acres from within present buffalo pasture and adjoining park headquarters, enabling visitors to the cave to see specimens of the game inclosed therein, should be built. This would also contain park spring, water supply, and storage tanks, and be amply large to maintain 25 animals the year round. I estimate the cost of such fence to be $1,500.

I recommend the building of 1 mile of permanent road within the park and properly shaping and macadamizing same for a width of 12 feet; other road and bridge work, lowering grades, and repair and upkeep of park roads in general. The former I estimate at $1,000, the latter at $700.

Lowering of pipe from spring to reservoir to insure against freezing and bursting; extension of pipe line from hydrant in road to barn—the two to cost about $300.

Constructing neat fence on north and south sides of yard, connecting game fence at rear to stone fence in front of house; requiring 22 rods, estimated cost $75.

Covering part of yard with coat of fertile soil 3 inches deep, to make possible a lawn; cost for labor about $100.

Partitioning and finishing of upstairs portion of park residence, making into three rooms and bathroom, toilet, and lavatory; estimated cost about $460.

Repair and improvement in the cave, putting in new stairs, bridges, ladders, and safeguards as old ones decay; about $150.

General repairs to buildings and grounds that unforeseen necessities for expenditure arise from require $100.

Repairing the pasture fence, rebuilding 1¾ miles of fence, requiring 450 new posts (using all old wire), $125.

Painting the barn, $35; telephone service for supervisor's office, $40; fuel for supervisor's office and public building, amounting to $50 for cutting and hauling wood for both stoves.

The supervisor's salary is insufficient for maintenance and should be adjusted to $1,500. There should be an allowance of $1 per day to the supervisor for expense of keeping horse for range service, $365.

I recommend the employment of one park ranger for guide and general service, July 1 to September 15 and May 1 to June 30, at $90 a month, and a second ranger from July 1 to September 15 and during the last half of June (three months), at $75 a month. First ranger's total salary, $405; second's, $225.

This park's share of expenses, salaries, etc., department representatives, general superintendent of national parks and his assistant, as established, $300.

Respectfully, T. W. BRAZELL,
Supervisor.

The SECRETARY OF THE INTERIOR.

RULES AND REGULATIONS.

GENERAL REGULATIONS OF MARCH 30, 1912.

Pursuant to authority conferred by the act of Congress approved January 9, 1903, the following rules and regulations for the government of the Wind Cave National Park, in South Dakota, are hereby established and made public:

1. It is forbidden to remove or injure the specimens or formations in and around the Wind Cave, or to deface the same by written inscription or otherwise, or to injure or disturb in any manner or carry off any of the mineral deposits, specimens, natural curiosities, or wonders on the Government lands within the park.

2. No person shall be permitted to enter the cave unless accompanied by the supervisor or other park employee, or by competent guides.

3. It is forbidden to cut or injure any timber growing on the park lands, or to deface or injure any Government property. Camping parties will be allowed to use dead or fallen timber for fuel.

4. Fires should be lighted only when necessary and completely extinguished when not longer required. The utmost care must be exercised at all times to avoid setting fire to the timber and grass.

5. Hunting or killing, wounding or capturing any bird or wild animal on the park lands, except dangerous animals when necessary to prevent them from destroying life or inflicting an injury, is prohibited. The outfits, including guns, traps, teams, horses, or means of transportation used by persons engaged in hunting, killing, trapping, ensnaring, or capturing such birds or wild animals, or in possession of game killed on the park lands under other circumstances than prescribed above, will be taken up by the supervisor and held subject to the order of the Secretary of the Interior, except in cases where it is shown by satisfactory evidence that the outfit is not the property of the person or persons violating this regulation and the actual owner thereof was not a party to such violation. Firearms will only be permitted in the park on written permission from the supervisor thereof.

6. Fishing in any other way than with hook and line is forbidden and may be prohibited by order of the supervisor in any of the waters of the park, or limited therein to any specified season of the year, until otherwise ordered by the Secretary of the Interior. Fishing for purposes of merchandise or profit is forbidden. All fish less than 8 inches in length should at once be returned to the water with the least damage possible to the fish. Fish that are to be retained must be at once killed by a blow on the back of the head or by thrusting a knife or other sharp instrument into the head.

7. No person will be permitted to reside permanently, engage in any business, or erect buildings, etc., upon the Government lands in the park without permission, in writing, from the Secretary of the Interior. The supervisor may grant authority to competent persons to act as guides and revoke the same in his discretion. No pack trains will be allowed in the park unless in charge of a duly registered guide.

8. Owners of patented lands within the park limits are entitled to the full use and enjoyment thereof; the boundaries of such lands, however, must be determined and marked and defined so that they may be readily distinguished from the park lands. While no limitations or conditions are imposed upon the use of such private lands so long as such use does not interfere with or injure the park, private owners must provide against trespass by their stock or cattle, or otherwise, upon the park lands, and all trespasses committed will be punished to the full extent of the law. Stock may be taken over the park lands to patented private lands with the written permission and under the supervision of the supervisor, but such permission and supervision are not required when access to such private lands is had wholly over roads or lands not owned or controlled by the United States.

9. Allowing the running at large, herding, or grazing of cattle or stock of any kind on the Government lands in the park, as well as the driving of such stock or cattle over same, is strictly forbidden, except where authority therefor has been granted by the supervisor. All cattle or stock found trespassing on the park lands will be impounded and disposed of as directed in regulations approved March 30, 1912.

10. No drinking saloon or barroom will be permitted upon Government lands in the park.

11. Private notices or advertisements shall not be posted or displayed on the Government lands within the reservation, except such as may be necessary for the convenience and guidance of the public.

12. Persons who render themselves obnoxious by disorderly conduct or bad behavior, or who violate any of the foregoing rules, will be summarily removed from the park and will not be allowed to return without permission, in writing, from the Secretary of the Interior or the supervisor of the park.

No lessee or licensee shall retain in his employ any person whose presence in the park shall be deemed and declared by the supervisor to be subversive of the good order and management of the reservation.

13. Any person who violates any of the foregoing regulations will be deemed guilty of a misdemeanor, and upon conviction be fined not more than $1,000, or be imprisoned not more than twelve months, or both, in the discretion of the court, as provided by the act creating the park.

14. The supervisor designated by the Secretary is hereby authorized and directed to remove all trespassers from the Government lands in the park and enforce these rules and regulations and all the provisions of the act of Congress aforesaid.

REGULATIONS OF MARCH 30, 1912, GOVERNING THE IMPOUNDING AND DISPOSITION OF LOOSE LIVE STOCK.

Horses, cattle, or other domestic live stock running at large or being herded or grazed on Government lands in the Wind Cave National Park without authority therefor will be taken up and impounded by the supervisor, who will at once give notice thereof to the owner, if known. If the owner is not known, notice of such impounding, giving a description of the animal or animals, with the brands thereon, will be posted in six public places inside the park and in two public places outside the park. Any owner of an animal thus impounded may at any time before the sale thereof reclaim the same upon proving ownership and paying the cost of notice and all expenses incident to the taking up and detention of such animal, including the cost of feeding and caring for the same. If any animal thus impounded shall not be reclaimed within thirty days from notice to the owner, or from the date of posting notices, it shall be sold at public auction at such time and place as may be fixed by the supervisor after ten days' notice, to be given by posting notices in six public places in the park and two public places outside the park, and by mailing to the owner, if known, a copy thereof.

All money received from the sale of such animals and remaining after the payment of all expenses incident to the taking up, impounding, and selling thereof, shall be carefully retained by the supervisor in a separate fund for a period of six months, during which time the net proceeds from the sale of any animal may be claimed by and paid to the owner upon the presentation of satisfactory proof of ownership, and if not so claimed within six months from the date of sale such proceeds shall be turned into the Wind Cave National Park fund.

The supervisor shall keep a record in which shall be set down a description of all animals impounded, giving the brands found on them, the date and locality of the taking up, the date of all notices and the manner in which they were given, the date of sale, the name and address of the purchaser, the amount for which each animal was sold and the cost incurred in connection therewith, and the disposition of the proceeds.

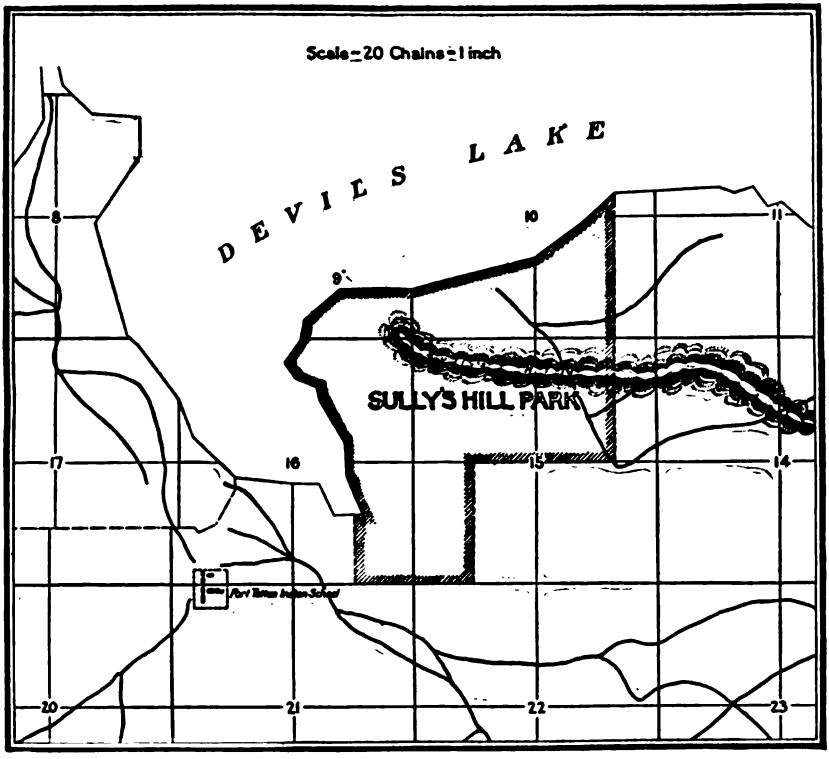
The supervisor will, in each instance, make every reasonable effort to ascertain the owner of animals impounded and to give actual notice thereof to such owner.

REPORT ON SULLYS HILL PARK, CASA GRANDE RUIN; THE MUIR WOODS, PETRIFIED FOREST, AND OTHER NATIONAL MONUMENTS, INCLUDING LIST OF BIRD RESERVES.

REPORT ON SULLYS HILL PARK, CASA GRANDE RUIN; THE MUIR WOODS, PETRIFIED FOREST, AND OTHER NATIONAL MONUMENTS; TOGETHER WITH LIST OF BIRD RESERVES.

SULLYS HILL PARK.

This reservation, set aside by Executive proclamation dated June 2, 1904, under the act approved April 27, 1904 (33 Stat., 319), contains about 780 acres. It is located on the south shore of Devils



Map of Sullys Hill Park.

Lake, N. Dak., having about 2 miles of shore line, with its western boundary 1 mile east of the Fort Totten Indian School. Inasmuch as no appropriation has been made for the care and protection of this reservation, Mr. Charles M. Ziebach, in charge of the Indian industrial school (Fort Totten), has been continued as acting superintendent, and required to exercise the necessary supervision and control over the park until appropriation is made therefor by Congress.

The tract is well wooded and has an ample supply of water and many rugged hills, among which, on the western boundary, lies what is known as Sullys Hill. In the southwestern part is a small body of water known as Sweet Water Lake, west of which the surface is generally level and the soil good. The acting superintendent in his report for 1915 states:

No appropriation has ever been made for the maintenance of this park, and no improvements have ever been placed in it other than cutting out a few trails through the timber for roads and cleaning up a small tract near a fresh-water lake in the park for picnic grounds. Nothing as yet has been done toward making permanent roads or otherwise beautifying the grounds. The natural beauties of the park and its popularity as a picnic ground have drawn an aggregate of about 1,000 people to the place for a short time. A very small portion of these people have spent a single night in the park, and none, as far as known, have camped in the park for a longer time.

Appropriations aggregating $10,000 have been made by Congress for the establishment and maintenance of a game preserve in this park, and it is anticipated that if such improvement is made as is intended by these acts, and a game preserve established it will draw more people to the place and eventually become one of the most attractive beauty spots in this State.

There should be some permanent roads built in this park, so as to make it more accessible to the public. A dock should be built on the lake shore, so that launches could draw up to it for a landing. The beach on the shore of Devils Lake is one of the best bathing beaches on the lake. Some bathhouses should be built and other minor improvements of this character made. A suitable residence should be constructed for a caretaker, and one employed.

An appropriation of about $10,000 would improve this park so that it would be accessible to the public, and would make it one of the most noted resorts in the State.

CASA GRANDE RUIN.

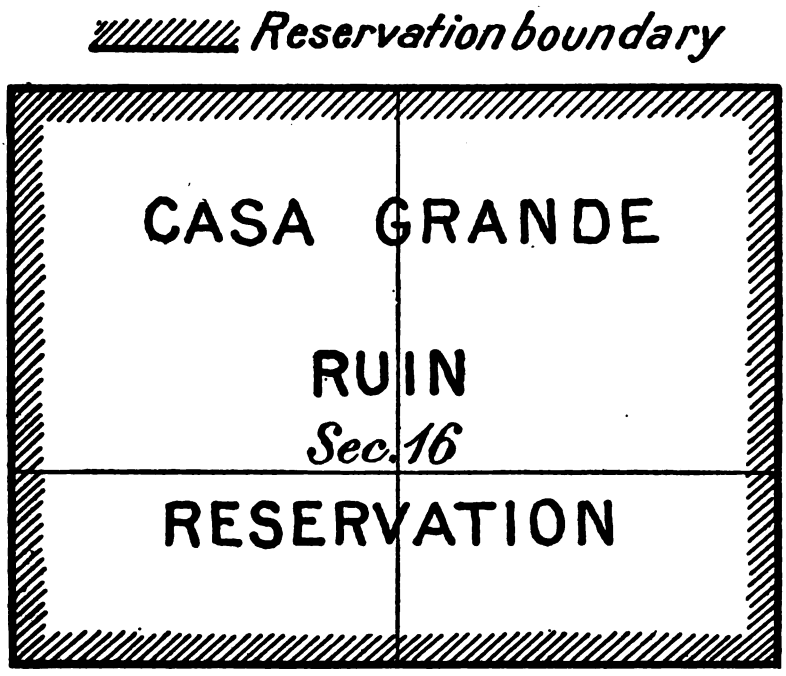
This reservation is located near Florence, Ariz., about 18 miles northeast of Casa Grande station, on the Southern Pacific Railway, and contains about 480 acres. It was set aside by Executive order dated June 22, 1892, under the act approved March 2, 1889 (25 Stat., 961). By presidential proclamation of December 10, 1909, the boundaries of the reservation were changed by the elimination of 120 acres on which there were no prehistoric ruins and the inclusion of a tract of 120 acres adjoining the reservation on the east on which are located important mounds of historic and scientific interest.

Casa Grande is an Indian ruin of undetermined antiquity, which was discovered in 1694 by Padre Kino, a Jesuit missionary. This great house is said to be the most important ruin of its type in the Southwest, and as such it has strong claims for archæological study, repair, and permanent preservation. It is built of puddled clay molded into walls and dried in the sun, and is of perishable character. The main building was originally five or six stories high and covered a space 59 feet by 43 feet 3 inches. The walls have been gradually disintegrating, owing to the action of the elements. A corrugated iron roof has heretofore been erected over this building to protect it, so far as practicable, from further decay.

Surrounding Casa Grande proper is a rectangular walled inclosure or "compound," having an area of about 2 acres. In this inclosure, which has been called Compound A, excavations conducted under the Bureau of American Ethnology have resulted in the uncovering of a number of buildings or clusters of rooms, and others are known to exist, but have not been excavated. Two other compounds were dis-

covered and designated, respectively, Compound B and Compound C, but the latter has not been excavated and is still in the form of a mound. These three compounds together constitute what is known as the Casa Grande group of ruins. As a result of this work, conducted under the Bureau of American Ethnology, the points of interest to visitors have been materially augmented. The ground plan of the ruin was increased by some 58 rooms, a number of plazas and surrounding walls, making the total number of rooms now open on the ground floor 100.

Mr. Frank Pinkley, the custodian, who resides on the reservation, reports that the number of visitors to the ruin is constantly increas-



Casa Grande Ruin Reservation, Ariz., embracing the NW. ¼, the NE. ¼, the N. ½ of the SW. ¼, and the N. ½ of the SE. ¼ of sec 16, T. 5 S., R. 8 E., Gila and Salt River meridian; set aside by Executive order of June 22, 1892, under act of March 2, 1889.

ing, owing to the ease with which the ruin can be reached by automobile. No injury has been done during the year by vandals, but some erosion is taking place, for which funds are needed for repair and protective work.

NATIONAL MONUMENTS AND PRESERVATION OF AMERICAN ANTIQUITIES.

GENERAL STATEMENT.

By the act approved June 8, 1906, entitled "An act for the preservation of American antiquities,"[1] the President of the United States is authorized, "in his discretion, to declare by public proclamation

[1] Text of this act is given on page 1109.

historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest that are situated upon the lands owned or controlled by the Government of the United States to be national monuments." Under such authority the President has created the following monuments:

National monuments administered by Interior Department.

Name.	State.	Date.	Area.
			Acres.
Devils Tower	Wyoming	Sept. 24, 1906	1,152
Montezuma Castle	Arizona	Dec. 8, 1906	160
El Morro	New Mexico	....do....	160
Chaco Canyon	....do....	Mar. 11, 1907	[1] 20,629
Muir Woods [2]	California	Jan. 9, 1908	295
Pinnacles	....do....	Jan. 16, 1908	2,080
Tumacacori	Arizona	Sept. 15, 1908	10
Mukuntuweap	Utah	July 31, 1909	[1] 15,840
Shoshone Cavern	Wyoming	Sept. 21, 1909	210
Natural Bridges [3]	Utah	Sept. 26, 1909	[1] 2,740
Gran Quivira	New Mexico	Nov. 1, 1909	[1] 160
Sitka	Alaska	Mar. 23, 1910	[1] 57
Rainbow Bridge [4]	Utah	May 30, 1910	160
Lewis and Clark Cavern	Montana	May 16, 1911	160
Colorado	Colorado	May 24, 1911	13,883
Petrified Forest	Arizona	July 31, 1911	25,625
Navajo	....do....	Mar. 14, 1912	360
Papago Saguaro	....do....	Jan. 31, 1914	2,050
Dinosaur	Utah	Oct. 4, 1915	80

[1] Estimated area.
[2] Donated to the United States.
[3] Originally set aside by proclamation of Apr. 16, 1908, and contained only 120 acres.
[4] Within an Indian reservation.

The following regulations for the protection of national monuments were promulgated on November 19, 1910:

1. Fires are absolutely prohibited.
2. No firearms are allowed.
3. No fishing permitted.
4. Flowers, ferns, or shrubs must not be picked, nor may any damage be done to the trees.
5. Vehicles and horses may be left only at the places designated for this purpose.
6. Lunches may be eaten only at the spots marked out for such use, and all refuse and litter must be placed in the receptacles provided.
7. Pollution of the water in any manner is prohibited; it must be kept clean enough for drinking purposes.
8. No drinking saloon or barroom will be permitted.
9. Persons rendering themselves obnoxious by disorderly conduct or bad behavior, or who may violate any of the foregoing rules, will be summarily removed.

Officers having supervision of national monuments.

George Hayworth, New Customhouse Building, San Francisco, Cal.:
Muir Woods National Monument, Cal.
Pinnacles National Monument, Cal.
H. Stanley Hinrichs, Federal Building, Salt Lake City, Utah:
Mukuntuweap National Monument, Utah.
Natural Bridges National Monument, Utah.
Rainbow Bridge National Monument, Utah.

Benjamin H. Gibbs, Santa Fe, N. Mex.:
Montezuma Castle National Monument, Ariz.
Petrified Forest National Monument, Ariz.
Tumacacori National Monument, Ariz.
Navajo National Monument, Ariz.
Papago Saguaro National Monument, Ariz.
El Morro National Monument, N. Mex.
Chaco Canyon National Monument, N. Mex.
Gran Quivira National Monument, N. Mex.[1]
Ira Lantz, Helena, Mont.:
Lewis and Clark Cavern National Monument, Mont.
Adelbert Baker, Cheyenne, Wyo.:
Devils Tower National Monument, Wyo.
Shoshone Cavern National Monument, Wyo.
A. Christensen, Juneau, Alaska:
Sitka National Monument, Alaska.

Administrative conditions.—The supervision of these various monuments has, in the absence of any specific appropriation for their protection and improvement, necessarily been intrusted to the field officers of the department having charge of the territory in which the respective monuments are located.

Administrative conditions continue to be unsatisfactory, as no appropriation of funds has yet been made available for this important protective and preservative work. Such supervision as has been possible in the cases of a few monuments only has been wholly inadequate and has not prevented vandalism, destruction of natural formations, unauthorized exploitation, or spoliation of relics found in those prehistoric ruins, whose preservation is contemplated by the passage of the act of June 8, 1906.

An estimate in the sum of $5,000 for preservation, development, administration, and protection of these national monuments was submitted on December 15, 1913 (through the Secretary of the Treasury), by the Department of the Interior to Congress, and is incorporated in House Document No. 506, Sixty-third Congress, second session. Congress, however, did not act favorably upon this estimate. An estimate in similar amount has been included by this department in its general estimates for the fiscal year ending June 30, 1917. This fund is needed, not so much for the purpose of preserving by restoration the objects reserved in the national monuments as to prevent the removal of valuable relics and vandalism. Monuments suffering from these causes should be provided with a custodian or superintendent, and in this way a small general appropriation can be made most useful and its expenditure will be wholly in the interest of the public. The protection and preservation of the national monuments as public reservations are of great interest and importance because a great variety of objects, historic, prehistoric, and scientific in character, are thus preserved for public use intact instead of being exploited by private individuals for gain and their treasures scattered. These reserves should be administered in connection with the national parks, which they strongly resemble. It would be difficult to define one in terms that would exclude the other. The renewal of the estimate for a small appropriation has been made for the pur-

[1] By arrangement with the Secretary of Agriculture, the district forester of the Mansano National Forest, with headquarters at Albuquerque, N. Mex., has taken charge of patrol and protection of the Gran Quivira National Monument, as the Interior Department has no field officer in the immediate vicinity of the monument.

pose of keeping this class of reserves intact until such time as Congress shall authorize the creation of some administrative unit which shall take over both the parks and monuments and administer them under a general appropriation.

National monuments under other departments.—The following national monuments are not administered by the Secretary of the Interior:

National monuments administered by the Department of Agriculture.

Name.	State.	Date.	Area.
			Acres.
Cinder Cone	California	May 6, 1907	[1] 5,120
Lassen Peak	do	do	[1] 1,280
Gila Cliff dwellings	New Mexico	Nov. 16, 1907	160
Tonto	Arizona	Dec. 19, 1907	[1] 640
Grand Canyon	do	Jan. 11, 1908	[1] 806,400
Jewel Cave	South Dakota	Feb. 7, 1908	[1] 1,280
Wheeler	Colorado	Dec. 7, 1908	300
Oregon Caves	Oregon	July 12, 1909	480
Devil Postpile	California	July 6, 1911	800
Mount Olympus	Washington	Apr. 17, 1912	300,376

[1] Estimated area.

National monuments administered by the War Department.

Name.	State.	Date.	Area.
			Acres.
Big Hole Battle Field	Montana	[1] June 23, 1910	5
Cabrillo	California	[2] Oct. 14, 1913	1

[1] Set aside by Executive order. [2] Set aside by presidential proclamation.

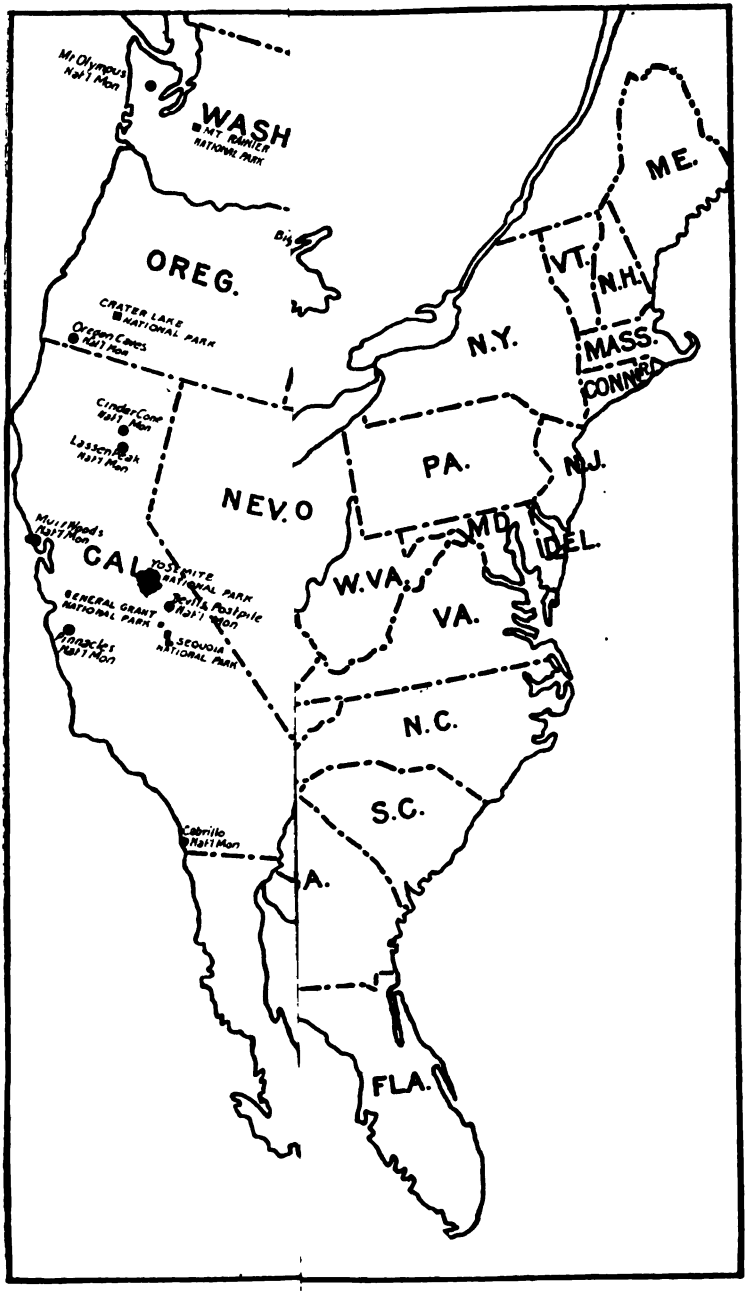
PERMITS FOR ARCHÆOLOGICAL EXPLORATION.

The uniform rules and regulations promulgated by the Secretaries of the Interior, Agriculture, and War, under date of December 28, 1906, to carry into effect the general provisions of the act for the preservation of American antiquities provide (par. 3) that—

> Permits for the excavation of ruins, the excavation of archæological sites, and the gathering of objects of antiquity will be granted, by the respective Secretaries having jurisdiction, to reputable museums, universities, colleges, or other recognized scientific or educational institutions, or to their duly authorized agents.

On February 19, 1915, permit was granted by this department to Prof. A. V. Kidder, curator of American archæology, Peabody Museum, Harvard University, to make examination and excavation of ruins in the Chinlee Valley and the tributary canyons which enter it below the Mexican Water and the canyons heading against the Navajo Mountain on its east and north sides, as continuation of explorations under similar permits granted by the department in 1913 and 1914. This locality is in the vicinity of the Navajo National Monument.

Permit was granted on April 22, 1915, to Mr. Edgar L. Hewett, director of the School of American Archæology, Santa Fe, N. Mex., to make explorations and excavations necessary for the making of an archæological report upon the district lying between the north bound-


WASH
MT RAINIER NATIONAL PARK
OREG.
CRATER LAKE NATIONAL PARK
NEV.O
CAL
YOSEMITE NATIONAL PARK
GENERAL GRANT NATIONAL PARK
SEQUOIA NATIONAL PARK
ME.
VT.
N.H.
N.Y.
MASS.
PA.
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ary of the Ramon Vigil Grant and the Guages Canyon, on the Pajarito Plateau, N. Mex., and to collect specimens for the use of the Commercial Museum, of Philadelphia, Pa., which institution collaborates with the School of American Archæology in this research work.

Permit was granted on May 20, 1915, to the Smithsonian Institution to make archæological reconnoissance of and, if deemed practicable, to conduct excavations and gather specimens on the public domain in Millard, Beaver, Iron, and Boxelder Counties, Utah, such collections to be permanently deposited in the United States National Museum.

On June 5, 1915, permit was granted Prof. Livingston Farrand, president of the University of Colorado, to prosecute archæological research on public lands under administration of the Interior Department in San Juan and Rio Arriba Counties, N. Mex., and in a strip of country 15 miles in width crossing Montezuma, La Plata, and Archuleta Counties (not, however, within the boundaries of Mesa Verde National Park), and to collect specimens. This work is in the nature of continuation of research under similar permit issued in 1914 covering territory contiguous to the above.

On June 10, 1915, permit was granted the University of Arizona, at Tucson, Ariz., to prosecute archæological research within the territory south and west of Navajo Mountain and in the Sagi Canyons in northern Arizona, east of the Colorado River, and to collect specimens for use of the university, such work to be conducted under personal supervision of Prof. Byron Cummings (formerly of the University of Utah), and the territory within which explorations take place not to overlap that covered by the above permit to Prof. Kidder.

Permit was granted on July 26, 1915, to Mr. Charles H. Robinson to gather archæological specimens on the public domain within the so-called "Spanish Diggings" country, located east of the Platte River, in Converse, Niobrara, Platte, and Goshen Counties, Wyo., during August, 1915, such collections to be permanently deposited, one-half in the McLean County (Ill.) Historical Society Museum, Bloomington, Ill., and one-half in the Illinois State Natural Historical Museum, at Springfield, Ill.

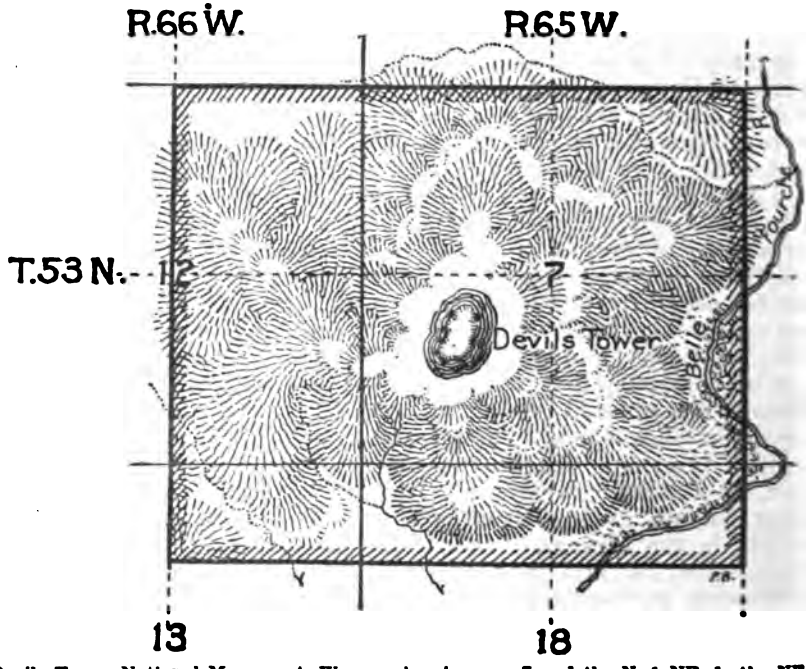
On August 17, 1915, authority was granted Dr. R. B. Earle to collect not exceeding 100 pounds of specimens of silicified wood from the Fossil Forest of Arizona (Petrified Forest National Monument) for the museum of New York University, and similar quantity for the museum of Hunter College.

DEVILS TOWER NATIONAL MONUMENT.

This extraordinary mass of igneous rock, known as the Devils Tower, is one of the most conspicuous and notable features in the Black Hills region, and has been known and utilized, doubtless, from time immemorial by the aborigines of the plains and mountains, for the American Indian of the last century was found to be directing his course to and from the hunt and foray by reference to this lofty pile. In their turn the white pioneers of civilization, in their exploration of the great Northwest, which began with the expedition of the Verendryes, pathfinders of the French Colonies of Canada, in 1742, utilized the tower as a landmark, and still later the military

expeditions into the Sioux and Crow Indian country during the Indian wars of the last century carried on operations within sight of the Devils Tower or directed their march by the aid of its ever-present beacon, for the tower is visible in some directions in that practically cloudless region for nearly 100 miles.

The tower is a steep-sided shaft rising 600 feet above a rounded ridge of sedimentary rocks, about 600 feet high, on the west bank of the Belle Fourche River. Its nearly flat top is elliptical in outline, with a diameter varying from 60 to 100 feet. Its sides are strongly fluted by the great columns of igneous rock, and are nearly perpendicular, except near the top, where there is some rounding, and near



Devils Tower National Monument, Wyo., embracing sec. 7 and the N. ½ NE. ¼, the NE. ¼ NW. ¼, and lot No. 1, sec. 18, T. 53 N., R. 65 W.; the E. ½ sec. 12 and the N. ½ NE. ¼ sec. 13, T. 53 N., R. 66 W., sixth principal meridian; created September 24, 1906.

the bottom, where there is considerable outward flare. The base merges into a talus of huge masses of broken columns lying on a platform of the lower buff sandstone of the Sundance geologic formation. Ascent can be made by the general public to the top of the base which surrounds the tower proper; it is not possible, however, for ascent of the tower to be made. The tower has been scaled in the past by means of special apparatus, but only at considerable risk.

The great columns of which the tower consists are mostly pentagonal in shape, but some are four or six sided. The average diameter is 6 feet, and in general the columns taper slightly toward the top. In places several columns unite in their upper portions to form a large fluted column. The columns slope inward toward the top. They are not much jointed, but are marked horizontally by faint ridges or swellings, which give the rock some appearance of bedding,

especially toward the top of the tower. In the lower quarter or third of the tower the columns bend outward and merge rapidly into massive rock, which toward the base shows but little trace of columnar structure. This massive rock circles the tower as a bench, extending out for 30 to 40 feet. On the southwest face the long columns curve outward over the massive, basal portion and lie nearly horizontal. The rugged pile of talus extends high up the lower slopes of the massive bench at the base of the tower and also far down the adjoining slopes of sedimentary rocks.

The nearest settlement to this national monument is Tower, in Crook County, Wyo., which is reached by stage from Moorcroft, Wyo., a distance of 32 miles. Moorcroft is on the Chicago, Burlington & Quincy Railway. The tower may also be reached by conveyance from Hulett, Wyo., which in turn is reached by stage from Aladdin, the western terminus of the Wyoming & Missouri River Railway.

MONTEZUMA CASTLE NATIONAL MONUMENT.

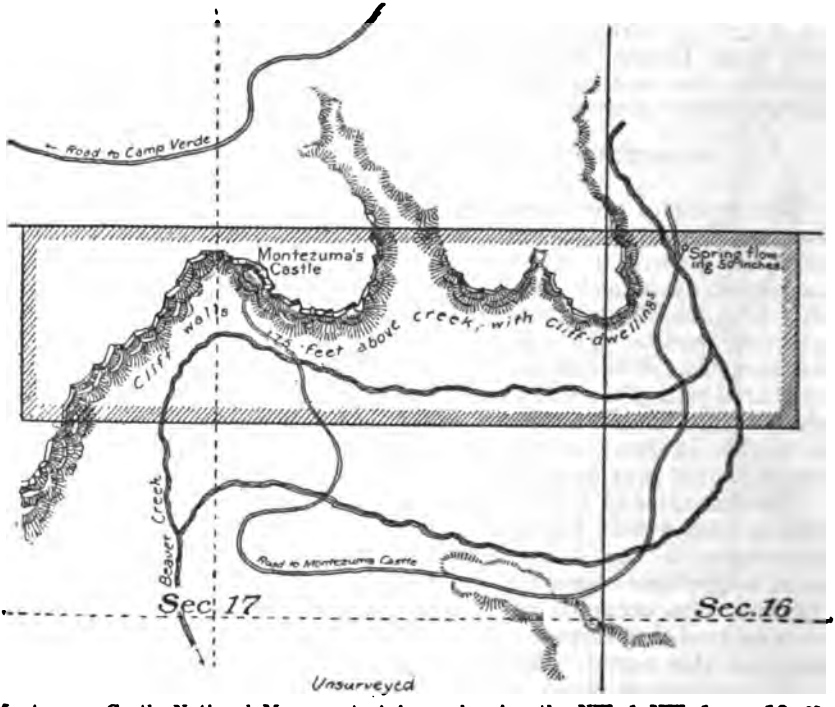
This national monument is situated in the northeastern part of Yavapai County, Ariz., and contains an assemblage of cliff dwellings, from the principal of which, known as Montezuma's Castle, this monument is named. This structure is of very great interest not only because of its picturesqueness but for ethnological and other scientific reasons. It is strictly a cliff dwelling, with the added importance that it is also a communal house. Although very small as compared with the great ruins of Chaco Canyon, Canyon de Chelley, Mesa Verde, the Mancos, and other localities of the Southwest, it is so unique in location and structural design and so perfectly preserved that it may be said to have no equal in the United States.

The character of the material used in the Verde cliff ruins, adobe, rubble, and a soft calcareous stone, has rendered the progress of disintegration and ruin somewhat rapid, though many centuries must have elapsed since the passing of the race. The Mojave Apache Indians, who occupied the valley at the advent of the white men, have no tradition respecting the existence of the people who formerly occupied this region. Montezuma's Castle, it is stated, is the only single perfect specimen and type of the architectural skill of the prehistoric cliff dwellers of this valley.

The monument embraces a prehistoric cliff-dwelling ruin of unusual size situated in a niche or cavity in the face of a vertical cliff 175 feet in height. The formation exposed along the face of the cliff is a compact tufa or volcanic ash. About half way up the cliff there is a bed of soft, unconsolidated tufa which has suffered considerable erosion, leaving irregular-shaped cavities. The bed of soft material is overlain by a harder formation which has withstood erosion and thus formed an overhanging sheltering reef.

The cliff-dwelling ruin known as Montezuma's Castle is situated in one of these cavities, the foundation being about 80 feet above the base of the cliff. The unique position and size of the ruin give it the appearance of an ancient castle and doubtless accounts for the present name. Access to the castle or ruin is made from the base of the cliff by means of four wooden ladders placed against the face of the cliff and anchored thereto with iron pins.

The structure is about 50 feet in height by 60 feet in width, built in the form of a crescent, with the convex part against the cliff. It is five stories high, the fifth story being back under the cliff and protected by a masonry wall 4 feet high, so that it is not visible from the outside. The walls of the structure are of masonry and adobe, plastered over on the inside and outside with mud. The cliff forms the back part of the structure, the front and outer walls being bound to the cliff with round timbers 6 to 10 inches in diameter, the outside ends projecting through the outer walls and the other end placed against the cliff. These timbers serve as joists for the several stories, the floors being made by placing small poles at right angles to the



Montezuma Castle National Monument, Ariz., embracing the NW. ¼ NW. ¼ sec. 16, the N. ½ NE. ¼ and NE. ¼ NW. ¼ sec. 17, T. 14 N., R. 5 E., Gila and Salt River meridian; created December 8, 1906.

larger timbers and covering with a thatch of willows, on top of which there is a covering of mud and stones 8 inches thick.

From the appearance of the walls now standing, the structure originally contained 25 rooms, 19 of which are now in fairly good condition. Besides the main building, there are many cave chambers below and at each side of the castle. These small chambers are neatly walled up in front and have small doorways.

The rooms average about 6 by 8 feet in size and are about 7 feet high. They are connected by small doorways, and the outside rooms have small peepholes, from which a view of the outside can be had. These were probably used for portholes through which arrows could be shot.

The timbers in the building are hacked on the ends and were doubtless cut with stone axes. They are in a good state of preservation, no decay having set in owing to the dry climate. The main part of the structure is sheltered by the overhanging cliff, and the walls, thus protected from storms, are in good condition. The front part of the structure is not so well protected and the walls are wearing away and crumbling.

The method employed by the public in reaching the castle is principally by automobile from Prescott, a small city on the Santa Fe, Prescott & Phoenix Railroad, a branch of the Santa Fe system, 54 miles to the west, or from Jerome, Ariz., on a branch line of the Santa Fe, Prescott & Phoenix Railroad, 27 miles distant from the monument. A fine automobile road has recently been constructed from Prescott to Camp Verde, a small settlement 3 miles west of the castle, and the trip from Prescott to the castle and return can now be comfortably made in one day. The castle can also be reached from Flagstaff, a station on the main line of the Santa Fe Railway, 58 miles to the north. The roads, however, are very heavy, and the trip can not be made via automobile without considerable difficulty. Tourists frequently make the trip from Flagstaff by team, as it affords an opportunity of going through the large pine forest lying to the south of Flagstaff. There are two garages in Prescott making a specialty of taking parties to the castle. Each furnishes a driver who acts as a guide.

EL MORRO NATIONAL MONUMENT.

A feature of great historic interest and importance is the so-called El Morro or Inscription Rock, some 35 miles almost due east of Zuni Pueblo in western-central New Mexico.

El Morro is an enormous sandstone rock rising a couple of hundred feet out of the plain and eroded in such fantastic forms as to give it the appearance of a great castle, hence its Spanish name. A small spring of water at the rock made it a convenient camping place for the Spanish explorers of the sixteenth, seventeenth, and eighteenth centuries, and the smooth face of the "castle" well adapted it to receive the inscriptions of the conquerors of that early period.

The earliest inscription is dated February 18, 1526. Historically the most important inscription is that of Juan de Onate, a colonizer of New Mexico and the founder of the city of Santa Fe, in 1606. It was in this year that Onate visited El Morro and carved this inscription on his return from a trip to the head of the Gulf of California. There are 19 other Spanish inscriptions of almost equal importance, among them that of Don Diego de Vargas, who in 1692 reconquered the Pueblo Indians after their rebellion against Spanish authority in 1680.

It is not too much to say that no rock formation in the West or perhaps in the world is so well adapted to the purpose for which this table of stone was used—at least history does not record any collection of similar data. Here are records covering two centuries, some of which are the only extant memoranda of the early expeditions and explorations of what is now the southwestern part of the United States. On these smooth walls, usually under some projecting

stratum, inscriptions were cut by the early conquerors and explorers, which have made this rock one among the most interesting objects on the continent.

Here, in this remote and uninhabited region, in the shadows of one of Nature's most unique obelisks, wrapped in the profound silence of the desert, with no living thing to break the stillness, it is hard to realize that 300 years ago these same walls echoed the clank of steel harness and coats of mail; that with the implements of Spanish conquest the pathfinders in the New World were carving historical records upon the eternal rock.

Locally Inscription Rock and El Morro are known as separate and distinct monumental rocks. The latter, translated The Castle, is the rock standing out in bold relief to the east, while Inscription Rock is the name applied to the formation to the west, which is a part of the mesa. On the south side, in the angle formed by the two, one extending east and the other south, is a great chamber or cavern, a natural amphitheater where secure refuge from storm or human foe could easily be secured. It is here, too, that the only spring within many miles wells up as if to make the natural fortification doubly secure. Upon these walls are many of the best preserved Spanish inscriptions, although there are quite a number 200 feet east, under the shadows of a stately pine tree and on the north side of El Morro. Most of them are as plain and apparently as legible as the day they were written; especially is this true of the older ones, carved during the sixteenth and seventeenth centuries.

The existence of extensive, prehistoric ruins on the very summit of Inscription Rock is another feature of interest. On the top of the rock a deep cleft or canyon divides the western end of the formation. On each of these arms is the remnant of large communal houses or pueblos. Some of the walls are yet standing and the ground plans of the structures are well defined. That on the south arm, and almost overhanging the cavern and spring, is approximately 200 by 150 feet. Some of the buildings must have been more than one story in height.

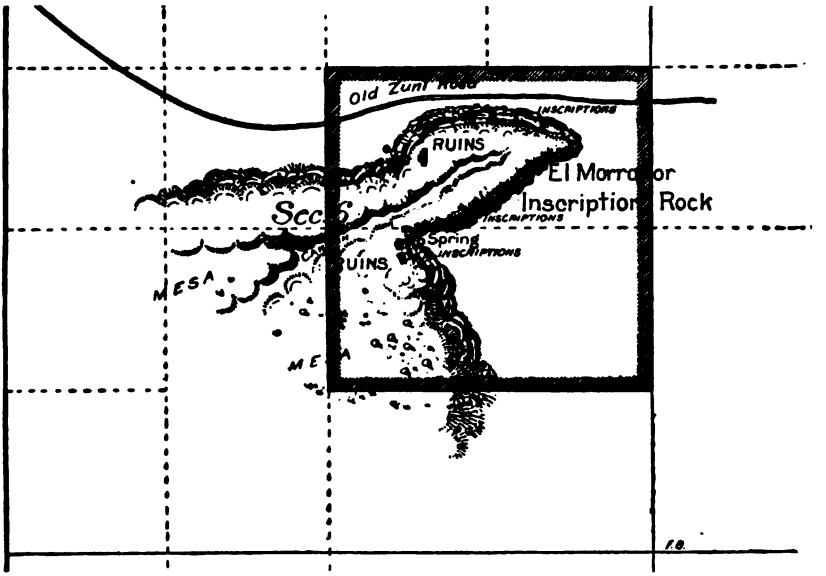
The remarkable natural defenses of the site and the existence of the spring doubtless induced the builders to select this odd location. At some distant day it may be desirable to excavate these ruins and thus add to this historic spot attractions for the scientist as well as the general public who are interested in scenic and natural curiosities.

This monument is usually visited from Thoreau or Gallup, N. Mex., the points from which access is most easily had. These points are on the main line of the Atchison, Topeka & Santa Fe Railway, and the visit to the monument is made by team and camp outfit. The trip is made in four days, in five for better comfort, and the cost for team, mountain hack, and driver, not including cost of provisions and feed of team, is from $6 to $8 per day. Good livery may be had at both of said points.

The main (Chicago to San Francisco) line of the Atchison, Topeka & Santa Fe Railway is the only railroad through the district, and one would have to travel hundreds of miles overland to reach the monument by any other railroad. The monument is approximately 40 miles by stage from Thoreau, N. Mex., and 55 miles by like conveyance from Gallup, N. Mex.

The country traversed in a visit from Gallup or Thoreau is a high, rolling plateau of fair scenic beauty. Plenty of water holes are

present along the road and firewood can be had in abundance at most any place. Some forest is encountered on the road from Gallup. The monument can be visited at all seasons of the year, the summer, of course, being the most delightful time. The winters in the section are not cold or severe, and visits could be made at that time comfortably. A visit to this monument can be enlivened by incorporating with it a trip to the Pueblo of the Zuni Indians, there visiting the United States Indian school and village. This visit can be made without detouring any extent while going to the monument. The village mentioned is spoken of in the records of the visits of the first Spanish explorers to the region in the latter part of the fifteenth and first part of the sixteenth centuries, and is the oldest continuously occupied Pueblo Indian village in existence so far as is known.



El Morro National Monument, N. Mex., embracing the S. ½ NE. ¼ and N. ½ SE. ¼ sec. 6, T. 9 N., R. 14 W., New Mexico meridian; created December 8, 1906.

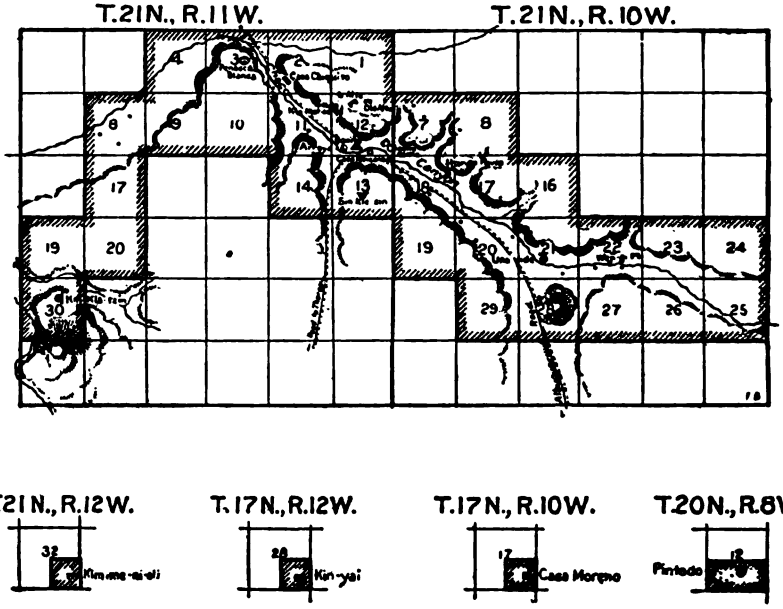
CHACO CANYON NATIONAL MONUMENT.

These remarkable relics of an unknown people embrace numerous communal or pueblo dwellings built of stone, among which is the ruin known as Pueblo Bonito, containing, as it originally stood, 1,200 rooms and being the largest prehistoric ruin yet discovered in the Southwest. Numerous other ruins, containing from 50 to 100 or more rooms, are scattered along Chaco Canyon and tributaries for a distance of about 14 miles and upon adjacent territory to the east, south, and west of Chaco Canyon many miles farther. The most important of these ruins are as follows: Pueblo Bonito, Chettro Kettle, Arroyo, New Alto, Old Alto, Kin-Klet Soi, Casa Chiquita, Penasco Blanco, Kin-Kla-tzin, Hungo Pavis, Unda Vidie, Weji-gi, Kim-me-ni-oli, Kin-yai, Casa Morena, and Pintado.

But little excavating has been done upon this monument, and what has been done was done for the most part more than 10 years ago.

The ruins of the monument therefore are in good condition. These ruins are the principal features of the monument; in fact, it might be said are the only features thereof. The fact that but little excavating has been done in them leaves the monument in condition for preservation of the ruins practically in their entirety for such historical purposes as imparting ideas of the life of the peoples who inhabited them, their development, etc.

The monument can only be reached by team, mountain hack, and camping outfit from Farmington, N. Mex., on the Denver & Rio



Chaco Canyon National Monument, N. Mex., embracing secs. 7 and 8 and 16 to 29, inclusive, T. 21 N., R. 10 W.; secs. 1, 2, 3, 4, and 8 to 14, inclusive, and 17, 19, 20, and 30, T. 21 N., R. 11 W.; S. ½ sec. 12, T. 20 N., R. 8 W.; SE. ¼ sec. 32, T. 21 N., R. 12 W.; SE. ¼ sec. 28, T. 17 N., R. 12 W.; SE. ¼ sec. 17, T. 17 N., R. 10 W.; New Mexico principal meridian; created March 11, 1907.

Grande Railroad, 65 miles to the north, and from Gallup or Thoreau, N. Mex., on the Atchison, Topeka & Santa Fe Railway, 75 miles and 65 miles, respectively, to the south. This service may be procured at from $6 to $8 per day, with driver, exclusive of the cost of feed and subsistence.

There are no accommodations for the public at or near this monument, and visitors must resort to camping.

The trip by team and camp outfit is suggested, and such a trip from the points mentioned will consume from two to three days on the road each way. On such a trip the driver arranges for camping at certain water holes at night, and after arrival at the ruins there is not much trouble to find water. Wood is scarce on the ruins, but coal may be gotten from a mine 4 miles distant from Pueblo Bonito, providing one is equipped to dig the same. The country traversed is a high, rolling, and broken plateau, carrying with it the scenic beauty and attractiveness of immense waste of land.

MUIR WOODS NATIONAL MONUMENT.

On December 31, 1907, the Secretary of the Interior, for and on behalf of the United States, accepted from William Kent and his wife, Elizabeth Thatcher Kent, of Chicago, Ill., in accordance with the act of Congress approved June 8, 1906, entitled "An act for the preservation of American antiquities," a deed conveying to the United States the following-described land, situate in Marin County, Cal.:

Beginning at a stake, A. 7, driven in the center of the road in Redwood Cañon and located by the following courses and distances from the point of commencement of the tract of land which was conveyed by the Tamalpais Land and Water Company to William Kent by a deed dated August 29th, 1905, and recorded in the office of the county recorder of Marin County, California, Book 95 of Deeds, at page 58, to wit: North eighteen degrees thirty-two minutes, east two hundred thirty-two and sixty-four hundredths feet, north sixty-six degrees thirty minutes, west one hundred and sixty-seven and thirty-four hundredths feet, north eighty-six degrees twenty-five minutes, west ninety-eight and sixty-two hundredths feet, north seventy degrees no minutes, west two hundred and forty-one and seven hundredths feet, north fifty-seven degrees twenty-nine minutes, west one hundred seventy-eight and three-hundredths feet, north forty-six degrees twenty-two minutes, west two hundred thirty-five and thirty-nine hundredths feet, and north twenty-four degrees twenty-five minutes, west two hundred twenty-five and fifty-six hundredths feet; thence from said stake, A. 7, the point of beginning, south fifty-four degrees nineteen minutes, west fourteen hundred eighty-two and seven-tenths feet to Station A. 8, from which Station 4 of the survey of the tract of land conveyed to William Kent as aforesaid bears south fifty-four degrees nineteen minutes, west three hundred ten feet distant; thence from said Station A. 8 north forty-seven degrees thirty minutes, west twenty-six hundred eighty feet; thence due west six hundred fifty and eight-tenths feet; thence north fifty-two degrees thirty minutes, west eleven hundred feet; thence north nineteen degrees forty-five minutes, west ten hundred fifty-eight and four-tenths feet to Station A. 12, from which Station 16 of the survey of the tract of land conveyed to William Kent as aforesaid bears south eighty-three degrees forty-two minutes, west three hundred ten feet distant; thence north eighty-three degrees forty-two minutes, east thirty-one hundred nine and two-tenths feet; thence north fifty-five degrees twenty-eight minutes, east fifteen hundred fifty feet to an iron bolt, three-quarters of an inch in diameter and thirty inches long, Station 14; thence south seventeen degrees eighteen minutes, east twenty-eight hundred twenty and nine-tenths feet; thence south four degrees ten minutes, east nine hundred thirty feet to a stake, A. 16, driven in the center of a graded road; and thence south-forty-five degrees seventeen minutes, west two hundred ninety-eight and five-tenths feet to said stake A. 7, the place of beginning. Containing an area of two hundred ninety-five acres, a little more or less.

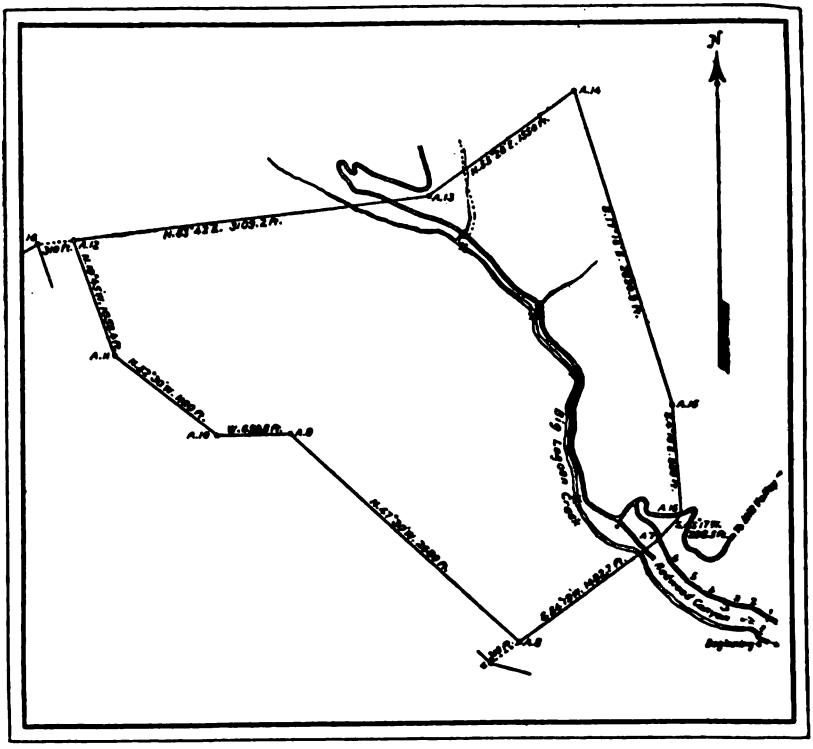
On January 9, 1908, the President, by virtue of the power and authority vested in him by section 2 of said act, declared, proclaimed, and set apart the lands described as a "national monument to be known and recognized as Muir Woods National Monument." The Secretary of the Interior had, prior to the date last mentioned, withdrawn the lands from entry or sale.

On September 10, 1908, the department prescribed regulations as follows for the government and protection of said monument:

The following rules and regulations for the government of the Muir Woods National Monument, in the State of California, set aside under the provisions of the act of Congress approved June 8, 1906, are hereby established and made public pursuant to the authority conferred by said act:

1. Fires are absolutely prohibited.
2. No firearms allowed.
3. No fishing permitted.

4. Flowers, ferns, or shrubs must not be picked, nor may any damage be done to the trees.
5. Vehicles and horses may be left only at the places designated for this purpose.
6. Lunches may be eaten only at the spots marked out for such use, and all refuse and litter must be placed in the receptacles provided.
7. Pollution of the water in any manner is prohibited. It must be kept clean enough for drinking purposes.
8. No drinking saloon or barroom will be permitted.
9. Persons rendering themselves obnoxious by disorderly conduct or bad behavior or who may violate any of the foregoing rules will be summarily removed.



Muir Woods National Monument, Cal., in T. 1 N., R. 6 W., Mount Diablo meridian; created January 9, 1908.

While the sundry civil act approved May 27, 1908 (35 Stat., 317), was pending before Congress attention was called to the fact that no provision was made for the salaries of custodians or for other protection of national monuments, as recommended in the estimates for these services, and that the department would be embarrassed in its efforts to protect monuments from vandalism and unauthorized exploration or spoliation because of a lack of funds. The department had recommended an appropriation of $5,000 for these purposes. No appropriation, however, was made by Congress for the purpose. On July 11, 1910, Andrew Lind, of California, was appointed custodian of the Muir Woods National Monument, at a salary of $900 per annum, payable from the appropriation "Protection of public lands and timber," and he is still in charge.

These lands consist of one of the most noted redwood groves in the State of California, and were held in private ownership by Mr. Kent. The tract is of great scientific interest, contains many redwood trees which have grown to a height of 300 feet and have a diameter at the butt of 18 feet or more. It is located in a direct line about 7 miles from San Francisco, Cal., and is in close proximity to a large and growing suburban population.

In Mr. Lind's report for the year he states:

During the fiscal year 1915 the amount of $960 was expended from the appropriation for "Protecting public lands, timber, etc., 1915," on account of the Muir Woods National Monument, this amount being expended entirely for services of the custodian and his assistant.

The custodian and his assistant have been engaged exclusively in patrolling the park, enforcing the rules and regulations governing national monuments, and in removing fallen trees, branches, etc., from the roads and trails.

It is estimated that approximately 25,000 people visited the park during the year. The bad weather experienced during the first five months of the calendar year 1915 has resulted in a reduction of the number of visitors.

The condition of the roads and trails in the park remains unchanged, except that in the Ocean View trail, along the east side of the park, the brush has grown to a considerable height. The brush in the fire lanes has also grown considerably.

It is recommended that the sum of $500 be expended for cleaning the existing fire lanes and for removing brush from the Ocean View trail. Attention is respectfully invited to the fact that these fire lanes have not been cleaned since July, 1912; in their present condition they are practically no protection to the monument.

PINNACLES NATIONAL MONUMENT.

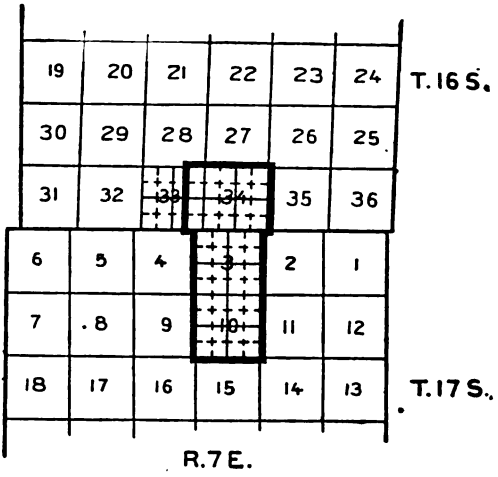
This national monument, created by proclamation of January 16, 1908, embraces 2,091.21 acres of land, of which approximately 1,900 acres is under governmental control, a small portion having been patented to private ownership prior to creation of the monument.

The name is derived from the spirelike formations arising from 600 to 1,000 feet from the floor of the canyon, forming a landmark visible many miles in every direction. Many of the rocks are so precipitous that they can not be scaled. A series of caves, opening one into the other, lie under each of the groups of rock. These caves vary greatly in size, one in particular, known as the Banquet Hall, being about 100 feet square with a ceiling 30 feet high. The caves are entered through narrow canyons with perpendicular rock walls and overhanging bowlders. One huge stone, called the Temple Rock, is almost cubical in form. It stands alone in the bottom of the canyon and its walls rise perpendicularly to a height of over 200 feet. There are also several specimens of "balancing rocks" in each of the groups. The pinnacles, domes, caves, and subterranean passages of the monument are awe-inspiring on close inspection, and are well worth a visit by tourists and lovers of nature in its primitive state.

There are two groups of the so-called Pinnacles Rocks, known locally as the Big Pinnacles and the Little Pinnacles. The general characteristics of the two groups are similar. Each covers an area of about 160 acres very irregular in outline. There are springs of good water in what are known as the Chalone and Bear Creek gorges.

There are no stage lines to the monument. The best means of reaching the monument is by private conveyance over private roads

from either Soledad or Gonzales, in Monterey County, Cal., stations on the main line of the Southern Pacific Railway distant, respectively, 12 and 14 miles; or from Hollister, in San Benito County (also on the Southern Pacific), distant 35 miles. There is a good public highway from Hollister to within about 6 miles of the monument, from which a private road runs through several ranches for about 4 miles that is passable for automobiles. Between the end of the private road and the main gorge of the monument a road passable for teams leads up the bed of Chalone Creek. The route from Hollister is the most direct, as it leads to the east side of the pinnacles, where the gorges and caves are easily accessible, while the routes from Soledad or Gonzales lead to the west side and necessitate a journey, either by foot or saddle horse, to the eastern side to reach the caves and gorges.



Pinnacles National Monument, Cal.; embraces parts of Tps. 16 and 17 S., R. 7 E., M. D. M.; created January 16, 1908.

TUMACACORI NATIONAL MONUMENT.

This monument embraces 10 acres of land in Santa Cruz County, Ariz., about 57 miles south of Tucson and 17 miles north of Nogales, relinquished to the United States by a homestead entryman for the purposes specified in the act of June 8, 1906. Upon the tract is located a very ancient Spanish mission ruin, dating it is thought from the latter part of the sixteenth century, built by Jesuit priests from Spain and operated by them for over a hundred years.

After the year 1769 priests belonging to the order of Franciscan Fathers took charge of the mission and repaired its crumbling walls, maintaining peaceable possession thereof for about 60 years. In the early part of the nineteenth century the mission was attacked by Apache Indians, who drove the priests away and disbanded the peaceable Papago Indians residing in the vicinity of the mission. When found by the Americans, about the year 1850, the mission was in a condition of ruin.

The ruins as they stand consist of the walls and tower of an old church building, the walls of a mortuary chamber at the north end of the church building, and a court or church yard, surrounded by an adobe wall 2½ feet thick and 6 feet high.

The walls of the church building are 6 feet thick, built of adobe and plastered both inside and outside with lime mortar 1 inch thick. The dome over the altar and the belfry tower are constructed of burned brick, this being one of the characteristics of the architecture of the mission, in which respect the construction differs from other early Spanish missions. Inside the dimensions of the church are 18 feet wide by 75 feet in length. The part used for the altar is situate at the north end. It is 18 feet square, surmounted with a circular dome, finished on the inside with white plaster decorated or frescoed in colors. The plaster and decorations are in a good state of preservation, but the altar is entirely gone. On the east of the altar room there is a sanctuary chamber, 16 by 20 feet, 20 feet high, covered with a circular roof built of burned brick, supported in the center by an arch. This is the only part of the mission which is now roofed over. In the south end of the church there was an arched partition which formed a vestibule. This partition has been removed. The outside wall of the north end of the church building is decorated with white plaster studded at regular intervals with clusters made of fragments of broken slag and broken brick.

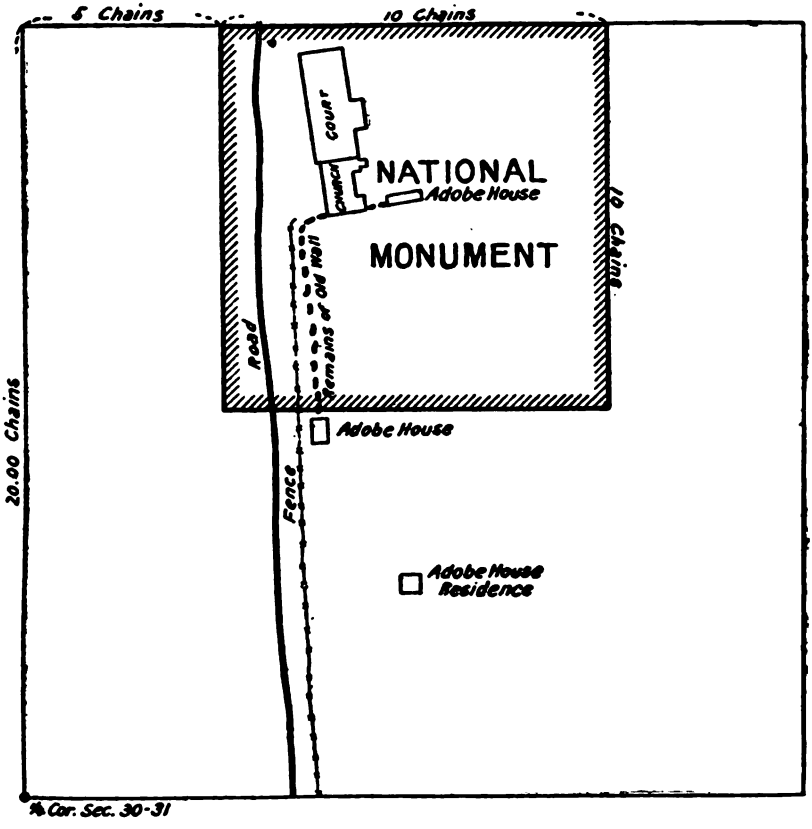
About 25 feet north of the church building, and in the center of the churchyard, there is a circular mortuary chamber. The wall is 3½ feet thick by 16 feet high, built of adobe, surmounted on the top with a row of ornamental cornice brick (made of burned brick). The chamber has one entrance. The walls were originally decorated on the outside with white plaster studded with fragments of red brick.

The entrance to the church is at the south and has an arched doorway. The arch has partially broken out and the wall above thereby weakened. To the east of the entrance there is a room, about 18 feet square, with a winding stairway inside leading up to the belfry. The stairs, however, are gone, only the adobe walls on which the stairs were built being left. Access to the belfry is gained by means of this old stairway. This room is surmounted with the belfry tower, which is constructed of burned brick. The walls supporting the tower are adobe, and are rapidly wearing away. The support under the southwest corner of the belfry is now gone, and the brickwork is overhanging with no support and liable to fall at any time. Through action of the elements the church, appurtenant buildings, and inclosing walls are in a very bad state of ruin, most of the roofs having long since fallen in and portions of the main building having become undermined. No preservative or restorative measures have been taken, and until funds become available therefor much further deterioration is to be expected.

On March 19, 1915, the department appointed Mr. W. E. Balcom, of Tubac, Ariz., custodian of this monument. Mr. Balcom has for the past seven years lived on a ranch immediately adjoining the monument, and has done important service in protecting the ruins from vandalism.

The State highway between Tucson and Nogales passes the mission and is a good automobile road. The Tucson-Nogales branch of the Southern Pacific Railway passes within a mile of the mission, the nearest railroad station being Tubac, 3 miles to the north.

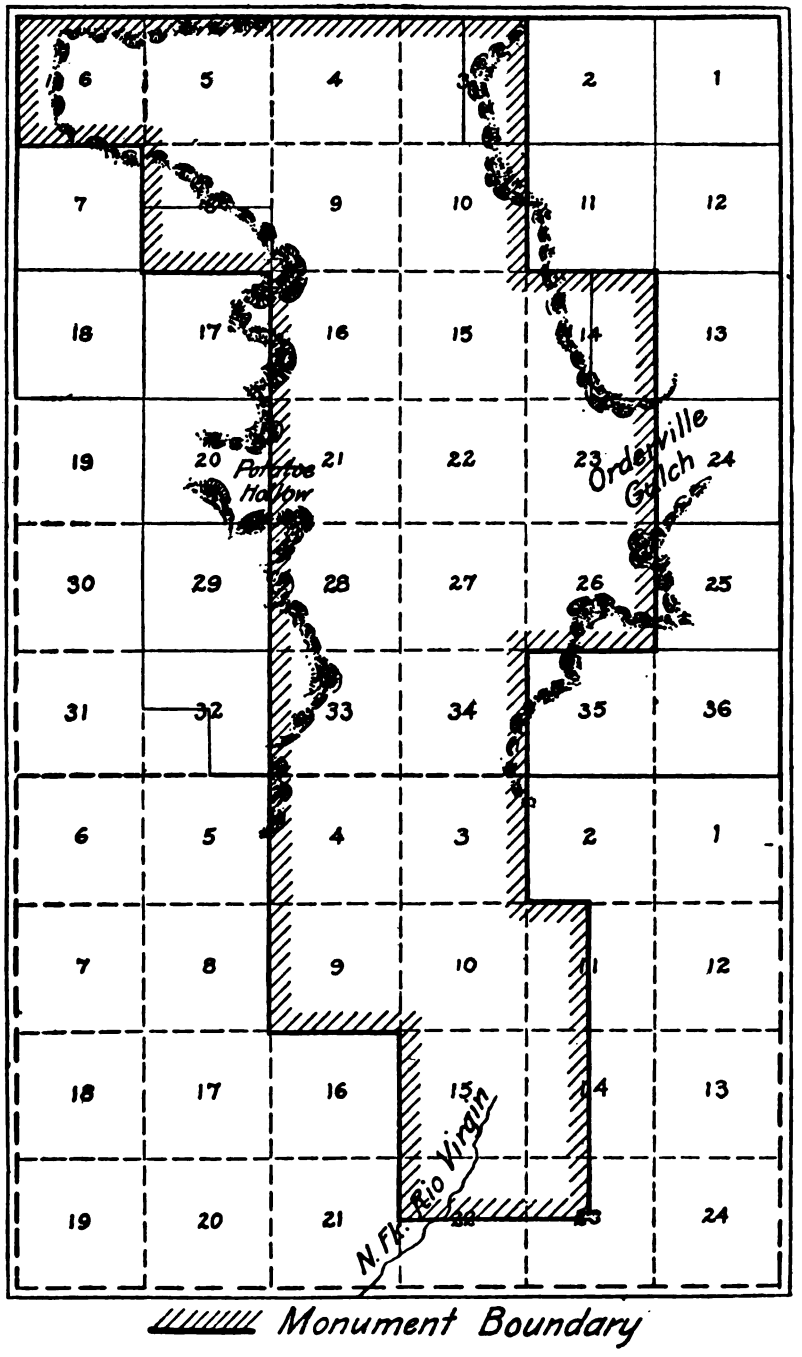
The best means of travel for the public in reaching the monument is by auto mail hack which leaves Nogales, Ariz., every morning except Monday, arriving at the ruin at 10 a. m., and leaving by the same automobile for Nogales at 5.30 p. m. The round-trip fare is $3.



Tumacacori National Monument, Ariz., embracing the E. ½ NW. ¼ SW. ¼ SE. ¼ and the W. ½ NE. ¼ SW. ¼ SE. ¼, sec. 30, T. 21 S., R. 13 E., Gila and Salt River meridians; created September 15, 1908.

MUKUNTUWEAP NATIONAL MONUMENT.

The Mukuntuweap National Monument, Utah, embraces the magnificent gorge of Zion Creek, called the Mukuntuweap Canyon by the Powell Topographic Survey of southwestern Utah, Kanab sheet, and the same is of the greatest scientific interest. The canyon walls are smooth, vertical, sandstone precipices, from 800 to 2,000 feet deep. These walls are unscalable within the limits of the boundaries of the reserve, except at one point about 4 miles from the southern and 6 miles from the northern extremity. The North Fork of the Rio Virgin passes through the canyon, and it is stated that the views into



Mukuntuweap National Monument, Utah, embracing secs. 3, 4, 5, 6, 8, 9, 10, 14, 15, 16, 21, 22, 23, 26, 27, 28, 33, and 34, T. 40 S., R. 10 W., and all of the Mukuntuweap Canyon in T. 41 S., R. 10 W., Salt Lake meridian; created July 31, 1909.

the canyon from its rim are exceeded in beauty and grandeur only by the similar views into the Grand Canyon of the Colorado.

At intervals along the west wall of the canyon are watercourses which cross the rim and plunge into the gorge in waterfalls 800 to 2,000 feet high.

The monument is best reached by way of the Denver & Rio Grande Railroad, through the town of Richfield to Marysvale, in central Utah, where the train is left and either stage or private conveyance taken. This route will take the tourist through the towns of Junction, Panguitch, Glendale, Mount Carmel, and Rockville to Springdale. The mileage by this route by horse or automobile is about 135 miles.

The latter part of this route—from Mount Carmel to Rockville—is rough and a hard road to travel, although it is being driven by autoists every season.

Travelers desiring to visit this monument may obtain accurate information, without cost, by writing the passenger department of the railroad company named, addressing their communications to the city passenger agent, Salt Lake City, Utah.

Those desiring to make the trip by automobile may obtain detailed and definite information concerning roads, hotels, oil, gas, routes, distances, etc., by writing the "Publicity Bureau, Commercial Club, Salt Lake City," or from the Utah Automobile Association, at Salt Lake City.

SHOSHONE CAVERN NATIONAL MONUMENT.

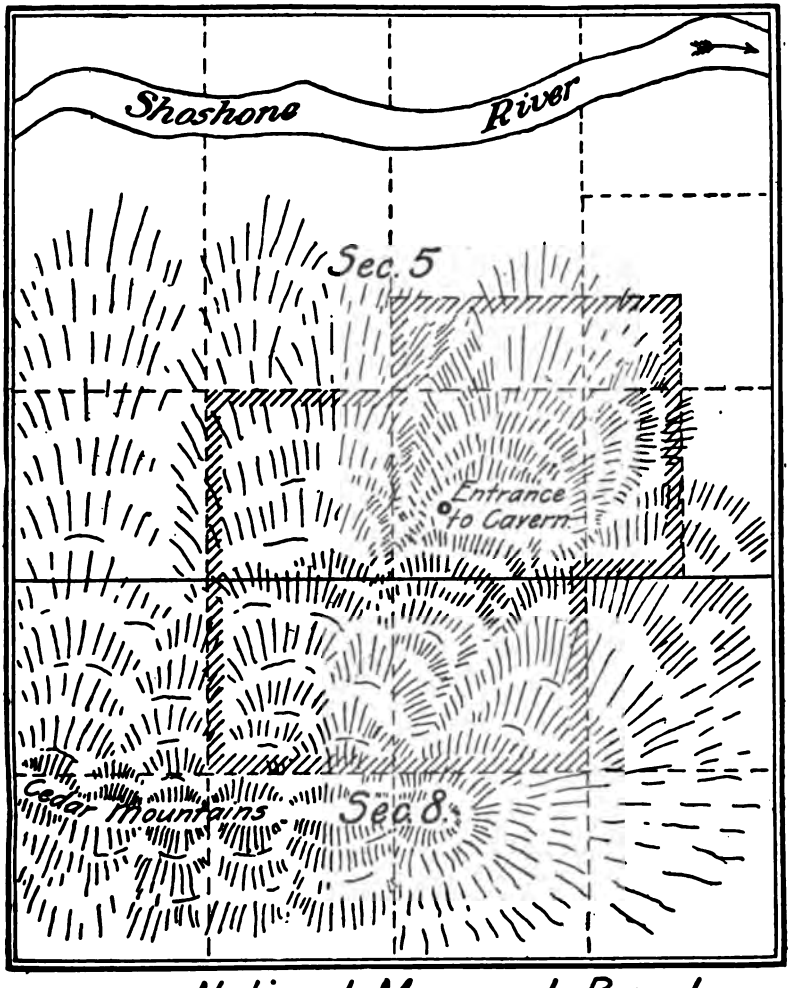
The Shoshone Cavern National Monument embraces 210 acres of rough mountainous land lying about 3 miles east of the great Shoshone Dam, in Big Horn County, Wyo. It was created by presidential proclamation of September 21, 1909. The cavern entrance is located at the summit of a reef of rocks at the head of a canyon upon the north face of Cedar Mountain, about 4 miles southwesterly from Cody, Wyo., on the Chicago, Burlington & Quincy Railway. The ascent to the entrance from the foot of the mountain is somewhat arduous. From the entrance the cavern runs in a southwesterly direction for more than 800 feet if measured in a direct line.

The best method of reaching the entrance is by means of the canyon leading from the foot of Cedar Mountain to the southwest of Cody on the east side of that mountain and which descends its eastern slope. It is possible to go by automobile or team to the foot of the mountain, a distance of about 2 miles from Cody, and then by a graded road about one-third of the way up the mountain. From the end of this road it is possible to go by foot or on horseback to within 100 feet of the entrance of the cave.

Entering the cave one proceeds for some distance, possibly 500 feet, where it is necessary to descend a steep rocky wall by means of a rope. Continuing, another declivity is encountered, and it is necessary to descend by rope about 30 feet. Advancing farther, possibly 3,000 to 4,000 feet, room after room is encountered, some of which are at least 150 feet in length and 40 or 50 feet in height. Some of these rooms, especially in the extreme interior, are beautifully incrusted with limestone crystals. Here and there as one proceeds through the accessible part of the cave can be seen small openings,

evidently leading into larger openings, but which as yet have not been explored.

The passages leading through the cavern are very intricate, and twist, turn, double back, and descend in other rooms, so that trip through the cave should not be attempted without a competent guide, with supply of ropes, and lamps. Guides can be employed in Cody.



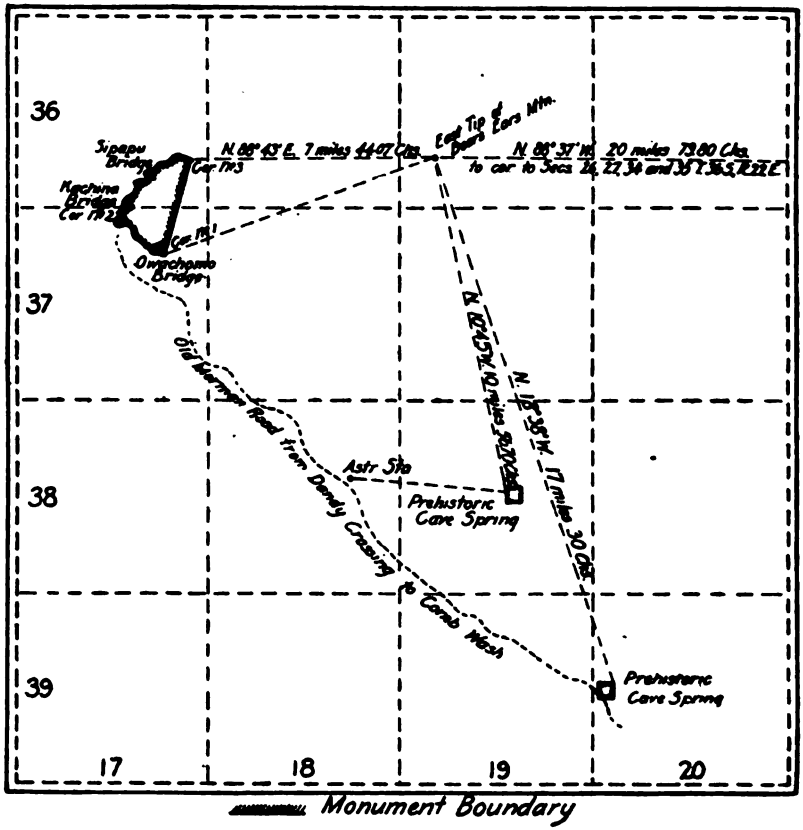
Shoshone Cavern National Monument, Wyo., embracing the SW. ¼ SE. ¼; W. ½ SE. ¼ SE. ¼; SW. ¼ NE. ¼ SE. ¼; S. ½ NW. ¼ SE. ¼; and SE. ¼ SW. ¼, sec. 5; the NW. ¼ NE. ¼ and NE. ¼ NW. ¼ sec. 8, T. 52 N., R. 102 W., sixth principal meridian; created September 21, 1909.

NATURAL BRIDGES NATIONAL MONUMENT.

This monument is located in the vicinity of Bluff, San Juan County, in the extreme southeastern portion of Utah, and was created originally by presidential proclamation of April 16, 1908. It

embraces three separate tracts of land, the largest containing the three great natural bridges, viz: The Sipapu, known locally as the Augusta Bridge; the Kachina, called the Caroline; and the Owachomo, given the local name of the Little Bridge.

A second proclamation, issued by the President September 25, 1909, includes, besides the three bridges originally reserved, a much more extended territory, but within which, along the walls of the canyons in the vicinity of the bridges, are found many prehistoric ruins of



Natural Bridges National Monument, Utah, embracing a subtriangular tract in unsurveyed Tps. 36 and 37 S., R. 17 E., and two smaller tracts, one each in T. 38 S., R. 19 E., and T. 39 S., R. 20 E., Salt Lake meridian; created September 25, 1909.

cavern and cliff dwellings. There are also two cavern springs containing some prehistoric ruins, which are located approximately 13 and 19 miles southeast of the bridges, respectively. These cavern springs are included within the Natural Bridges Monument. They are located upon the ancient and only trail to the bridges from the south, and are important way stations in the desert surrounding this monument. They are believed to have been originally excavated and used by the prehistoric inhabitants of the vicinity.

In order to reach the various points of interest in this monument it is necessary to use a pack train, with guides and complete camp

outfit. The natural bridges spring from the high walls of White Canyon, through which part of the journey is taken, and are the result of remarkable and eccentric stream erosion. These bridges are understood to be among the largest examples of their kind, the greatest of the three having a height of 222 feet, being 65 feet thick at the top of the arch. The arch is 28 feet wide, the span is 261 feet, and the height of span 157 feet. The other two bridges are only a little smaller. All three are within a space of about 5 miles.

There are two routes by which this monument may be reached, one by way of the Denver & Rio Grande Railroad, detraining at Dolores, Colo., thence by team to Bluff, Utah, via McElmo, Colo., and Aneth, Utah. This necessitates travel over a fairly good road for a distance of approximately 80 miles before Bluff, Utah, is reached. The bridges are about 45 miles northwest of Bluff, thus making a total mileage to be traveled by horse of about 125 miles. The springs lie between Bluff and the bridges and can be visited without making any side trips. Most of this route may be traveled by auto—from Dolores, Colo., to Bluff, Utah. Pack animals and guides are necessary from Bluff to the monument.

The second route may be taken by leaving the Denver & Rio Grande Railroad at Thompsons Station, Utah, thence by stage or team to Moab and Monticello, Utah, a distance of about 95 miles; thence to the monument (bridges), a distance of approximately 50 or 60 miles. At Monticello tourists should outfit for the trip to the bridges. Competent guides, with pack horses, etc., including all necessary equipment may be hired there at reasonable figures. This second route is the better, as roads and trails are better than from any other point.

Tourists coming in through Colorado may, after reaching Bluff, Utah, go north via Grayson to Monticello, a distance of about 50 miles, and proceed to the bridges from the latter point. As stated, Monticello is the best outfitting point in that section of the country and the best guides are to be found there.

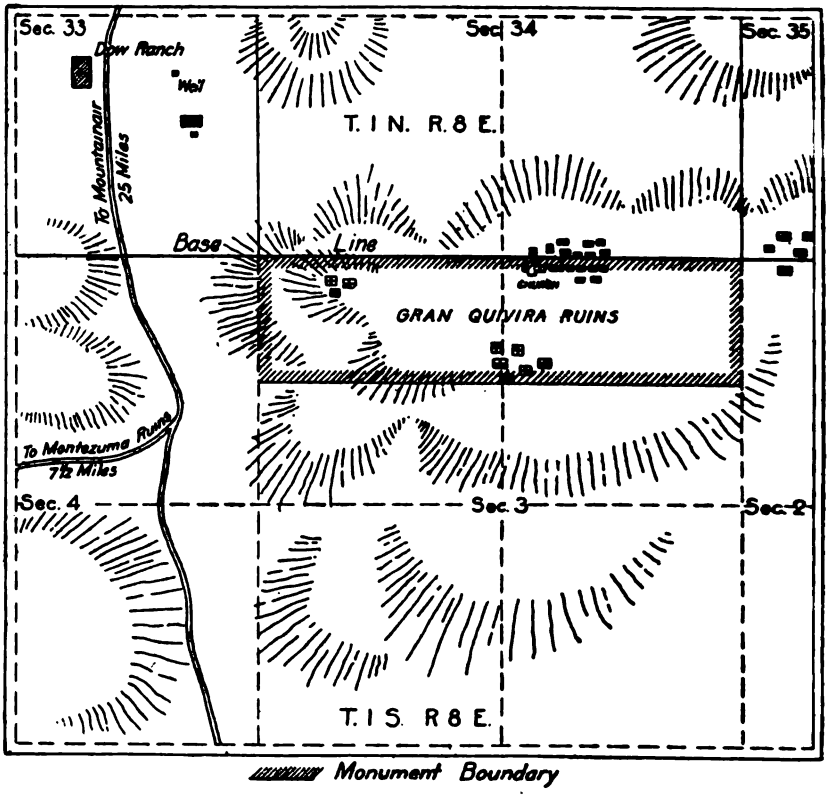
GRAN QUIVIRA NATIONAL MONUMENT.

The Gran Quivira has long been recognized as one of the most important of the earliest Spanish church or mission ruins in the Southwest. Near by are numerous Indian pueblo ruins, occupying an area many acres in extent, which also, with sufficient land to protect them, was reserved. The outside dimensions of the church ruin, which is in the form of a short-arm cross, are about 48 by 140 feet, and its walls are from 4 to 6 feet thick and from 12 to 20 feet high. Enough of the walls of this main building are present to show that originally it was at least three stories in height. The altitude at the ruins is about 6,800 feet and the ruins themselves are built upon an eminence visible for a great distance, commanding a vast expanse in all directions. These ruins are extensive and cover an area of probably 80 acres.

The Gran Quivira National Monument is located 1½ miles outside of the exterior boundaries of the Manzano National Forest, and is remote from the headquarters of any officer of this department.

On September 12, 1910, the Interior Department requested the Department of Agriculture to assume temporary charge of patrol and protection of this monument, in view of the better facilities at the disposal of the Forest Service in the Manzano National Forest, inasmuch as the monument is remote from location of any field officer of the Interior Department; and this charge was accepted by the Department of Agriculture. A ranger of the Forest Service of that department visits the monument every few weeks.

The Business Men's Association of Mountainair, N. Mex., is very active in preservation of the monument and in prevention of van-



Gran Quivira National Monument, N. Mex., embracing unsurveyed N. ½ of N. ½ sec. 3, T. 1 S., R. 8 E., New Mexico principal meridian; created November 1, 1909.

dalism, the site being visited (except in winter) by some member of the association at least once every two weeks.

On account of the altitude of the monument the region is subject to heavy snows between the middle of December and the latter part of March, so that visits to the monument during those months are not practicable. At other seasons the monument is best reached by stage or automobile by a good road from Mountainair, which is 24 miles distant on the Santa Fe Railway. Service of both classes may be obtained in Mountainair at any time, the parties operating auto-

mobiles for benefit of tourist traffic having established a schedule, so that parties of four people can visit the monument for $12 for the round trip; and parties of three persons or less, $10 for the round trip. There are no accommodations at the ruins, but water can be found along the route. The automobile trip occupies one day.

Other points of exceeding interest to tourists are located in the immediate vicinity of Mountainair and the Gran Quivira National Monument, though not upon Federal reservations. These are the ruins of Montezuma, of a nature similar to the Gran Quivira and some 8 miles to the northwest thereof; the region of Abo and the Painted Rocks, having a rather interesting geological origin, showing geologic studies in highly colored formation for a thickness of some 4,000 feet; the ruins and ancient Mexican villages of Cuarai, Punta, and Manzano, as well as Tajique and Chilili. These points are approximately the same distance in a northerly direction from Mountainair and have ancient ruins of churches and community dwellings, and are some of the best examples extant of the original plaza villages of the native Mexican population, the villages dating back to the very earliest Spanish settlement of this country, and showing the native life as it has always been, without alteration.

SITKA NATIONAL MONUMENT, ALASKA.

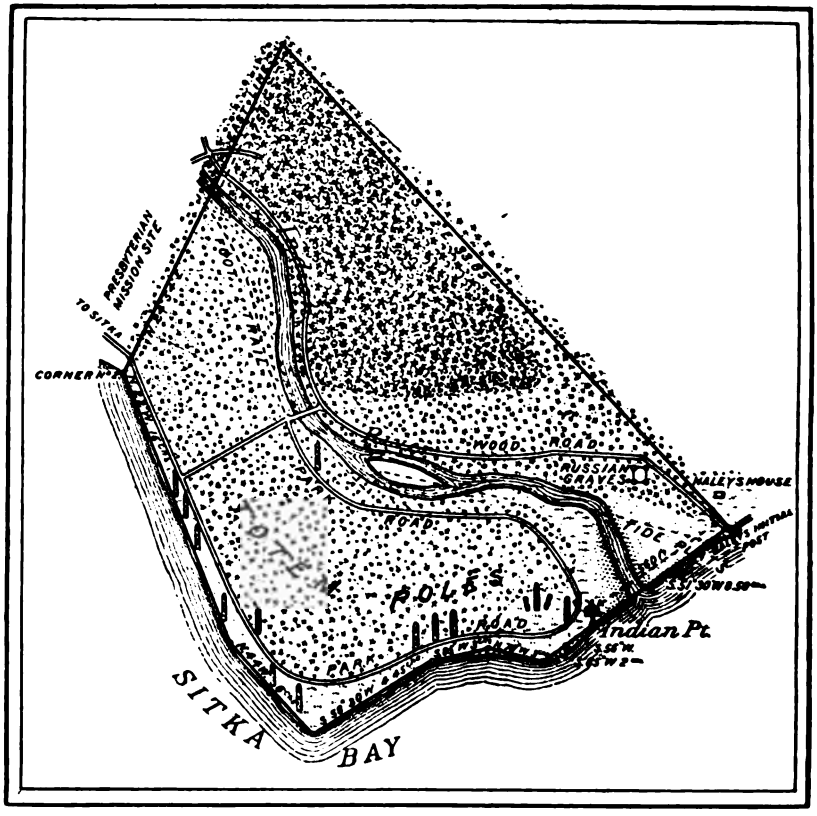
This monument reservation, created March 23, 1910, under the act of June 8, 1906, embraces about 57 acres of comparatively level gravel plain formed by sea wash and by the deposits of Indian River, which flows through the tract, and is situated about a mile from the steamboat landing at Sitka. Upon this ground was located formerly the village of a warlike tribe—the Kik-Siti Indians—who, in 1802, massacred the Russians in old Sitka and thereafter fortified themselves and defended their village against the Russians under Baranoff and Lisianski. Here, also, are the graves of a Russian midshipman and six sailors who were killed in a decisive battle in 1804. A celebrated "witch tree" of the natives and 16 totem poles, several of which are examples of the best work of the savage genealogists of the Alaska clans, stand sentrylike along the beach.

The following is from a letter dated August 31, 1913, from Arthur G. Shoup, member of Alaskan Legislature, to J. W. Lewis, special agent, General Land Office, and now part of General Land Office files:

> The great natural beauty of this park is extolled by every tourist who has ever visited Sitka, and it is partly on account of the exceptional opportunities that it affords for visitors from the States to see at once the timber growth, wild mosses and small verdure, and mountain streams of Alaska that our Government has so carefully guarded this reservation.
>
> Referring briefly to the historical features of the Sitka National Monument, or Indian River Park, as it is called: It was here that the Russians under Baranoff in 1802 fought and won the "decisive battle of Alaska" against the Indians and effected their lodgment in southeastern Alaska that placated the then very active attempts of Great Britain to get possession of this part of the country. The Russian title thus acquired to the Alexander Archipelago was later transferred to the United States, and because of this battle ground being in the Sitka National Monument it is of great patriotic interest to every Alaskan.

Another interesting feature of this park is that it is the place where the natives used to conduct their weird trials and executions for witchcraft. The tree where the victims were hanged still stands as an object of awe to the descendants of the old schamen and a subject of curiosity to the whites.

Estimate in amount $1,000 was submitted by the governor of Alaska (as part of estimates for the fiscal year ending June 30, 1917, for administration of that Territory) for protection and preservation of the Sitka National Monument, including repair of the ancient totems and other historic relics, and same has been included in the departmental estimates as forwarded to the Secretary of the Treasury.



Sitka National Monument, Alaska, embracing a tract of land which includes the mouth of Indian River and adjacent territory near Sitka; created March 23, 1910.

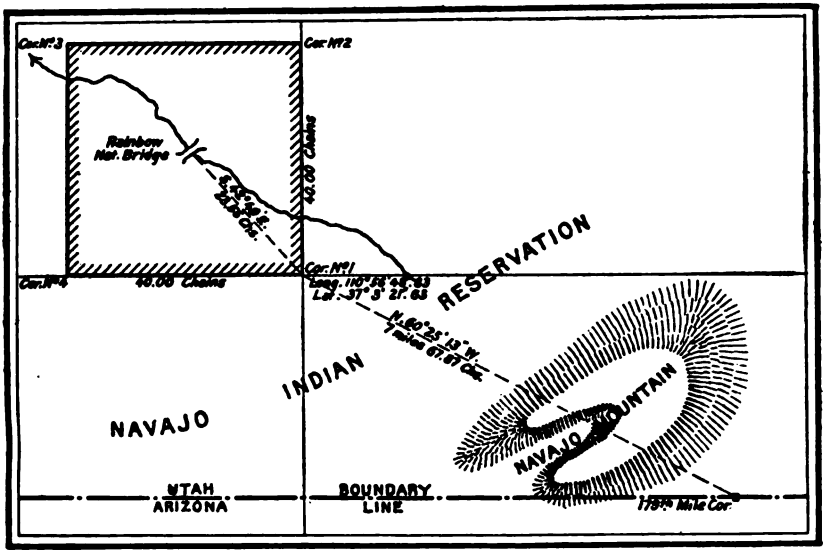
RAINBOW BRIDGE NATIONAL MONUMENT.

This natural bridge is located within the Navajo Indian Reservation, near the southern boundary of Utah, a few miles northwest from Navajo Mountain, a well-known peak and landmark, and spans a canyon and small stream which drains the northwestern slopes of this peak, and is of great scientific interest as an example of eccentric stream erosion. Among the known extraordinary natural bridges of the world, this bridge is unique in that it is not only a symmetrical arch below but presents also a curved surface above, thus presenting,

roughly, the character of the rainbow, for which it is named. Its height above the surface of the water is 309 feet and its span is 278 feet.

The existence of this natural wonder was first disclosed to William B. Douglass, an examiner of surveys of the General Land Office, on August 14, 1909, by a Piute Indian, called "Mike's boy," later "Jim," who was employed in connection with the survey of the natural bridges in White Canyon, Utah.

The best and easiest way in which to reach the Rainbow Bridge National Monument is to outfit at Monticello, thence travel to the Natural Bridges Monument, thence south and west down the Grand Gulch and the San Juan River. In order to reach Monticello tourists should leave the Denver & Rio Grande Railroad at Thompsons, Utah. This will necessitate travel by team and pack outfit of 220



Rainbow Bridge National Monument, Utah, embracing 160 acres of land in square form, the southeast corner of which bears from one hundred and seventy-ninth mile corner on the Utah and Arizona boundary N. 60° 25' 13" W. 7 miles 67.87 chains distant; created May 30, 1910.

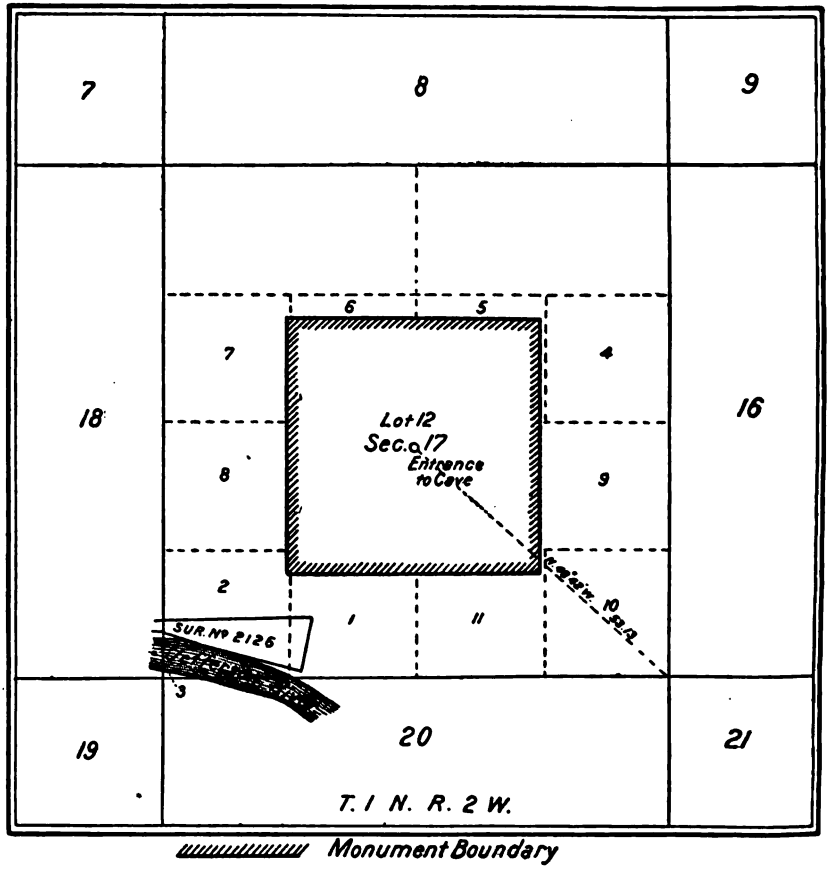
miles, approximately. While this may seem a very long trip, yet the scenery, cliff dwellings, prehistoric caves, vast canyons, etc., located between the Natural Bridges Monument and Rainbow Monument are worth the labor, time, and money expended.

LEWIS AND CLARK CAVERN NATIONAL MONUMENT.

The feature of this monument is a limestone cavern of great scientific interest, because of its length and because of the number of large vaulted chambers it contains. It is of historic interest, also, because it overlooks for a distance of more than 50 miles the trail of Lewis and Clark along the Jefferson River, named by them. The vaults of the cavern are magnificently decorated with stalactites and stalag-

mite formations of great variety in size, form, and color, the equal of, if not rivaling, the similar formations in the well-known Luray caves in Virginia. The cavern has been closed to the general public for some time on account of depredations by vandals.

The cavern is located about three-quarters of a mile northeasterly from Cavern, a post office in Jefferson County, and a station on the Northern Pacific Railway about 45 miles southwest from Butte, Mont. It is situated in a massive deposit of what is known as Madi-



Lewis and Clark Cavern National Monument, Mont., embracing lot 12, sec. 17, T. 1 N., R. 2 W.; Montana principal meridian; created by proclamations of May 11, 1908, and May 16, 1911.

son limestone, which at this place dips steeply to the southwest. The various chambers in the cave as far as explored extend for a distance of about 700 feet horizontally and 350 feet vertically, but there are many openings and passages that have never been explored. The chambers and passages seem in general to follow the dip of the formation. The cavern is best reached by following the railroad track easterly for about a quarter of a mile and then following a circuitous road or trail about 1½ miles. The mouths of the cavern are 1,300 feet

above the railroad, and the climb requires about an hour and a half. Its two entrances, which are about 100 yards apart, are upon the walls of a deep canyon about 500 feet below the rim.

The second proclamation establishing this monument is as follows:

Whereas the unsurveyed tract of land containing an extraordinary limestone cavern and embracing 160 acres, situated in township one north, range two west of the Montana principal meridian, Montana, and which was created the Lewis and Clark Cavern National Monument by proclamation dated the 11th day of May, 1908, has recently been definitely located by an official survey thereof, made under the direction of the Commissioner of the General Land Office, and such survey having determined that the tract in question lies wholly within the limits of the grant of the Northern Pacific Railway Co., but has not yet been patented to that company;

And whereas by its quitclaim deed the said Northern Pacific Railway Co. relinquished unto the United States all its right, title, and interest to lot 12, section 17, township 1 north, range 2 west of the Montana principal meridian, Montana, the same being the original tract proclaimed a national monument for the purpose of maintaining thereon the said Lewis and Clark Cavern National Monument, under the condition that the instrument of relinquishment shall become void and the premises immediately revert to the grantor should the monument no longer be maintained.

Now, therefore, I, William H. Taft, President of the United States of America, by virtue of the power in me vested by section two of the act of Congress approved June 8, 1906, entitled "An act for the preservation of American antiquities," do hereby set aside and confirm as the Lewis and Clark Cavern National Monument the said tract, embracing one hundred and sixty acres of land, at and surrounding the limestone cavern in section seventeen, township one north, range two west, Montana, subject to the conditions set forth in the relinquishment and quitclaim deed No. 18129E, dated February 14, 1911, of the Northern Pacific Railway Company, the said tract being in square form and designated as lot twelve in the survey and deed, with side lines running north and south and all sides equidistant from the main entrance of the said cavern, the center of said entrance bearing north forty-nine degrees, forty-two minutes west, fifty-three and thirteen hundredths chains distant from the corner to sections sixteen, seventeen, twenty, and twenty-one, as shown upon the diagram hereto attached and made a part hereof.

Warning is hereby expressly given to all persons not to appropriate, injure, or destroy any of the natural formations in the cavern hereby declared to be a national monument, nor to locate or settle upon any of the lands reserved and made a part of said monument by this proclamation.

In Witness whereof I have hereunto set my hand and caused the seal of the United States to be affixed.

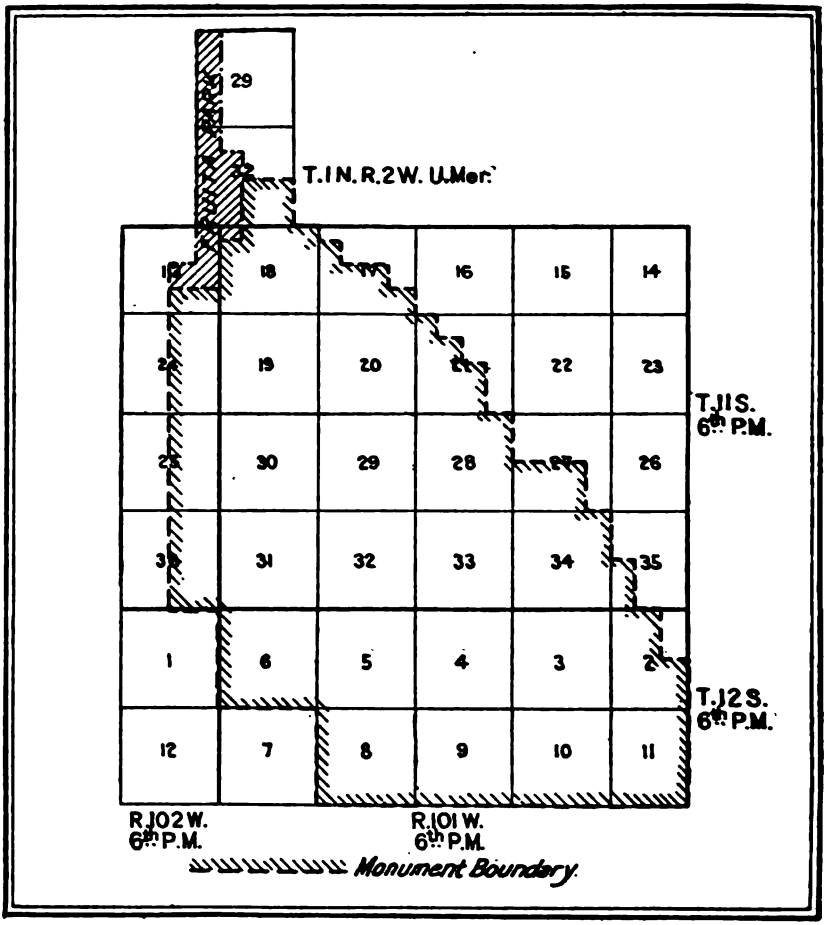
[SEAL.] Done at the city of Washington this sixteenth day of May, in the year of our Lord one thousand nine hundred and eleven, and of the independence of the United States the one hundred and thirty-fifth.

COLORADO NATIONAL MONUMENT.

This area was set aside as a national monument by the President's proclamation of May 24, 1911, and is situated near Grand Junction, Colo., from which that portion of the monument known as No Thoroughfare Canyon is reached by wagon road. Other parts of the monument are reached by foot trails. The site is in a picturesque canyon, which has long been an attractive feature of that portion of the State. The formation is similar to that of the Garden of the Gods at Colorado Springs, Colo., only much more beautiful and picturesque. With the exception of the Grand Canyon of the Colorado, it exhibits probably as highly colored, magnificent, and impressive examples of erosion, particularly of lofty monoliths, as may be found anywhere in the West. These monoliths are located in several tributary canyons. Some of them are of gigantic size, one

being over 400 feet high, almost circular in cross section, and 100 feet in diameter at base. There are also many caverns within the monument which have not been explored. There are many fine springs in the park, which furnish water to visitors. During the winter hundreds of deer come down into the park.

Mr. John Otto, of Fruita, Colo., has acted as custodian of this monument since June 7, 1911, and has single handed surveyed and



Colorado National Monument, Colo., embracing parts of Tps. 11 and 12 S., Rs. 101 and 102 W. of the sixth principal meridian, and part of sec. 32, T. 1 N., R. 2 W. of the Ute meridian, Colorado, containing 13,833.06 acres; created May 24, 1911.

built several good roads and trails and has carved steps in the monoliths which form the chief scenic features of the monument. Mr. Otto spends practically all of his time in the monument and is continually at work in making the monument more attractive and accessible.

By order of February 19, 1915, the President modified the proclamation of May 24, 1911, to the extent of authorizing the Secretary of the Interior to issue permits to the town of Fruita to occupy and

use certain lands in this monument in township 11 south, range 102 west, sixth principal meridian, for construction, operation, and maintenance of a conduit and related works for municipal water supply and power development.

PETRIFIED FOREST OF ARIZONA.

The Petrified Forest of Arizona lies in the area between the Little Colorado River and the Rio Puerco, 15 miles east of their junction. This area is of great interest because of the abundance of petrified coniferous trees, as well as its scenic features. The trees lie scattered about in great profusion; none, however, stands erect in its original place of growth, as do many of the petrified trees in the Yellowstone National Park. The trees probably at one time grew beside an inland sea; after falling they became waterlogged, and during decomposition the cell structure of the wood was entirely replaced by silica derived from sandstone in the surrounding land. Over a greater part of the entire area trees lie scattered in all conceivable positions and in fragments of all sizes. The localities where the petrified trees are found are known as the First Forest, Second Forest, and Rainbow Forest.

The First Forest lies 6 miles south of Adamana, a station on the Santa Fe Pacific Railway. In this forest there are not as many large tree trunks as in the other forests, the chief object of interest and perhaps the most prominent of all the scenic features of the region being the well-known Natural Bridge, consisting of a great petrified tree trunk 60 feet long spanning a canyon 45 feet in width, and forming a footbridge over which anyone may easily pass. The ends of the tree trunk are embedded in the surrounding sandstone, the canyon evidently having been formed after the tree had silicified.

The Second Forest lies about 2½ miles south of the First Forest and contains about 2,000 acres covered with fragments of petrified wood and tree trunks up to 4 feet in diameter. The wood is all highly colored and beautiful specimens are in abundance.

The third or Rainbow Forest lies about 13 miles south of Adamana and 18 miles southeast of Holbrook, Ariz., also on the Santa Fe Railway. In this forest the tree trunks are larger than elsewhere, more numerous, and less broken. There are in this vicinity several hundred whole trees, some of which are more than 200 feet long, partially embedded in the ground. The color of the wood is deeper and more striking than in the other localities. The main traveled road from Holbrook to St. Johns passes through this forest.

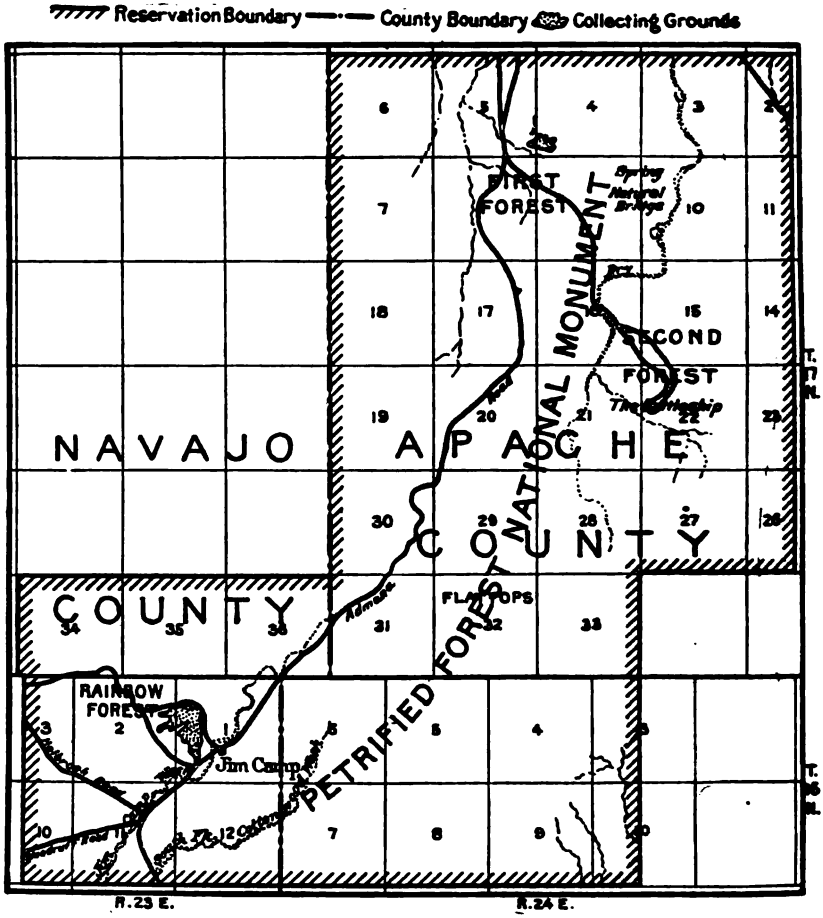
The First and Second Forests are reached by team and wagon from Adamana. The Third Forest can be reached from Adamana, but it is a long drive and is seldom made; the better method is by either team or automobile from Holbrook. The roads to the First and Second Forests from Holbrook are too sandy for automobile travel and the distance is too great to make the trip comfortably by team.

Prof. Lester F. Ward, of the Geological Survey, has stated that—

> There is no other petrified forest in which the wood assumes so many varied and interesting forms and colors, and it is these that present the chief attraction for the general public. The state of mineralization in which much of this wood exists almost places them among the gems or precious stones. Not only are chalcedony, opals, and agates found among them, but many approach the condition of jasper and onyx. The degree of hardness attained by them is such that they are said to make an excellent quality of emery.

Dr. Walter Hough, of the Smithsonian Institution, who visited this monument, states that—

In the celebrated Petrified Forest, which is some 18 miles from Holbrook, Ariz., on the picturesque Santa Fe Railroad, there are ruins of several ancient Indian villages. These villages are small, in some cases having merely a few houses, but what gives them a peculiar interest is that they were built of logs of beautiful fossil wood. * * * The prehistoric dwellers of the land selected



Petrified Forest National Monument, Ariz., embracing secs. 1, 2, 11, and 12 and E. ½ secs. 3 and 10; T. 16 N., R. 23 E.; secs. 4 to 9 and W. ½ secs. 3 and 10, T. 16 N., R. 24 E.; secs. 34, 35, 36, T. 17 N., R. 23 E., secs. 3 to 10, 15 to 22, 27 to 33, and W. ½ secs. 2, 11, 14, 23, 26, T. 17 N., R. 24 E., Gila and Salt River meridian, containing 40.04 square miles, set aside by proclamation of the President July 31, 1911.

cylinders of uniform size, which were seemingly determined by the carrying strength of a man. It is probable that prehistoric builders never chose more beautiful stones for the construction of their habitations than the trunks of the trees which flourished ages before man appeared on the earth.

This wood agate also furnished material for stone hammers, arrowheads, and knives, which are often found in ruins hundreds of miles from the forest.

Mr. Chester B. Campbell, custodian of the monument, reports that while the general condition of the monument is good, the natural bridge has become badly cracked and requires support, which could

best be effected by installing a steel beam running the entire length of the bridge. About 700 visitors per month go to the forests from Adamana.

NAVAJO NATIONAL MONUMENT.

The Navajo National Monument as originally created by proclamation of March 20, 1909, embraced approximately 600 acres within the Navajo Indian Reservation, which was reserved tentatively and with a view to reduction to such small tract or tracts as might thereafter be found to contain valuable prehistoric pueblo or cliff dwellings, when the extent of the same could be determined by an examination on the ground and their locus definitely fixed by traverse lines connecting them with some corner of the public survey. Both of these conditions having been fulfilled, the monument was reduced by proclamation dated March 14, 1912, to three small tracts aggregating 360 acres. Within two or these tracts are located, respectively, two interesting and extensive pueblo or cliff-dwelling ruins in a good state of preservation and known as Betata Kin and Keet Seel, and a third cliff-dwelling ruin called Inscription House.

The new boundaries of the Navajo National Monument under the latter proclamation are shown in figure 2.

The Betata Kin ruin gets its name from the fact that the buildings are situate on the steep sloping sides of a cliff, Betata Kin being the Navajo words signifying "sidehill house." They were found August 8, 1908, by J. W. Wetherill and Prof. Byron Cummings, a Navajo Indian having informed Mrs. Wetherill of their existence.

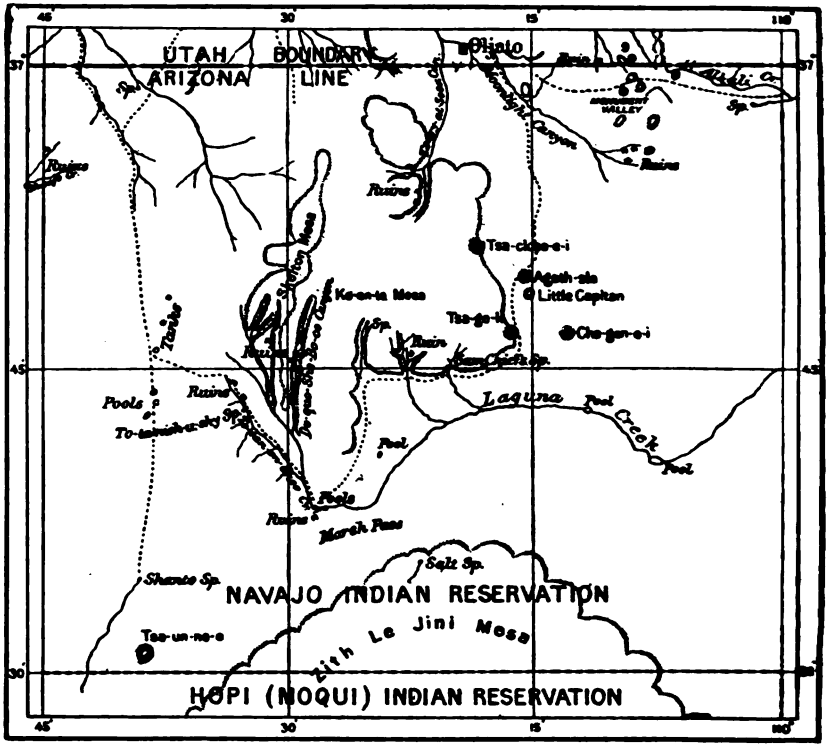
This ruin is situate at an elevation of 7,000 feet, in a crescent-shaped cavity 600 feet wide by 350 feet high, in the side of a soft red sandstone cliff which forms the walls of a small canyon. The location is about 2 miles west of Laguna Creek, 8 miles north of Marsh Pass, and 18 miles northwest of Kayenta, a post office and trading post on the Navajo Indian Reservation.

An inspection of the walls of the ruin indicates that there were originally 106 houses or rooms. The walls of 51 rooms are now standing, 17 of which have well-preserved roofs. The walls of the houses are constructed of sandstone blocks, held together with mud and mortar. The roofs are made of spruce timbers, placed crosswise to form joists, the ends projecting through the outer walls. Smaller poles are placed at right angles with these and then covered with a thatch of willows and mud, which forms the roof. Inside, the floors are plastered with mud; and in nearly every room there is a small circular or square hole about 9 inches deep, which was evidently used for a fireplace. The rooms have doorways or openings in the roofs and sides, the largest opening noted being 18 by 30 inches. The average size of the rooms is 6 by 6 by 6 feet.

The Keet Seel (Navajo for "broken pottery") ruins were discovered in March, 1894, by Richard Wetherill. They are situate at an elevation of 7,100 feet, in a crescent-shaped cave 400 feet long by 150 feet high, near the base of a soft red sandstone cliff on the west side of Laguna Creek, 12 miles north of Marsh Pass and 24 miles northwest of Kayenta.

These ruins are very much similar in construction to the Betata Kin ruins, but are in a much better state of preservation. This is doubtless due to the fact that the overhanging cliffs protect the

buildings from the action of storms. In the ruins there are several 2-story buildings and 2 circular-shaped rooms. There are 47 rooms with standing walls, the roofs having fallen in, and 56 rooms covered over with well-preserved roofs. The construction of the roofs in these buildings is similar to those in the Betata Kin ruins. The rooms are about 7 by 7 by 5 or 6 feet high. The openings or doorways are 18 inches by 30 inches, set about 2 feet from the floor of the structure.

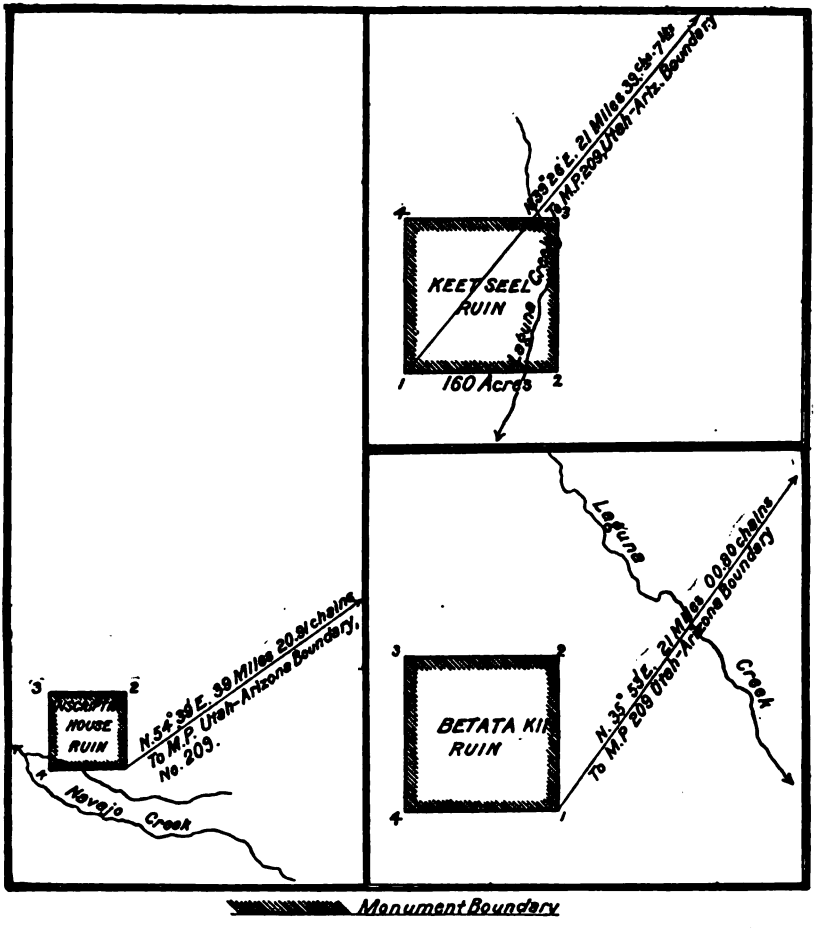


Navajo National Monument, Ariz., embracing all cliff-dwelling and pueblo ruins between the parallel of latitude 36° 30′ and 37° north and longitude 110° and 110° 45′ west from Greenwich, with 40 acres of land in square form around each of said ruins, as originally created March 20, 1909.

The ruins are difficult to reach, it being necessary to scale a steep sandstone cliff for a distance of 30 feet in order to reach the base of the ruins.

Inscription House Ruin is located on Navajo Creek, about 20 miles west of the Betata Kin Ruin. This ruin is regarded as extraordinary, not only because of its good state of preservation, but because of the fact that upon the walls of its rooms are found inscriptions written in Spanish by early explorers and plainly dated 1661. It is located about half way up the side of a steep cliff in a crescent-shaped niche or cave 15 to 50 feet in depth by 500 feet in length and about 75 feet in height. There is very little sheltering cliff over the ruins, and they are in places easily reached by storms.

These ruins differ from the other ruins in the material used in their construction. The walls are constructed of mud bricks made by rolling bunches of straw in mud and then molding into shape. The bricks are about 4 inches square by about a foot or more in length and are laid into the walls with mud mortar. The walls thus formed are tough and rigid and are free from cracks. Several of the rooms



Navajo National Monument, Ariz., containing 360 acres, embracing the Keet Seel and Betata Kin ruins, located in two small tracts of 160 acres each, along Laguna Creek, and Inscription House ruins, on Navajo Creek, in a 40-acre tract, all within the Navajo Indian Reservation, as reduced by proclamation of March 14, 1912.

are made of reeds and tules, set vertical and plastered over and filled in with mud. The roofs of the buildings are made of the mud bricks placed on a framework of small poles covered over with reeds and tules. There are 64 rooms, 30 of which are roofed over. The rooms are small and mostly single story. Two of the buildings are two stories high. The doorways are small and are built with a small niche at the bottom.

The ruins can be reached only by saddle horse and pack outfit over a very rough trail from Marsh Pass or Kayenta. Kayenta can be reached by team from Flagstaff, Ariz., via Tuba, or from Gallup, N. Mex., either point being about 125 miles distant. At Kayenta pack horses and guides can be secured to make a trip to the ruins, two or three days being required to visit the Betata Kin and Keet Seel Ruins, and at least three days more to visit the Inscription House Ruin. The Inscription House Ruin can best be reached from Tuba, via Red Lake, a distance of about 60 miles, over a rough mountain trail. The Santa Fe Railway is the nearest and most accessible railroad from which to reach the ruins.

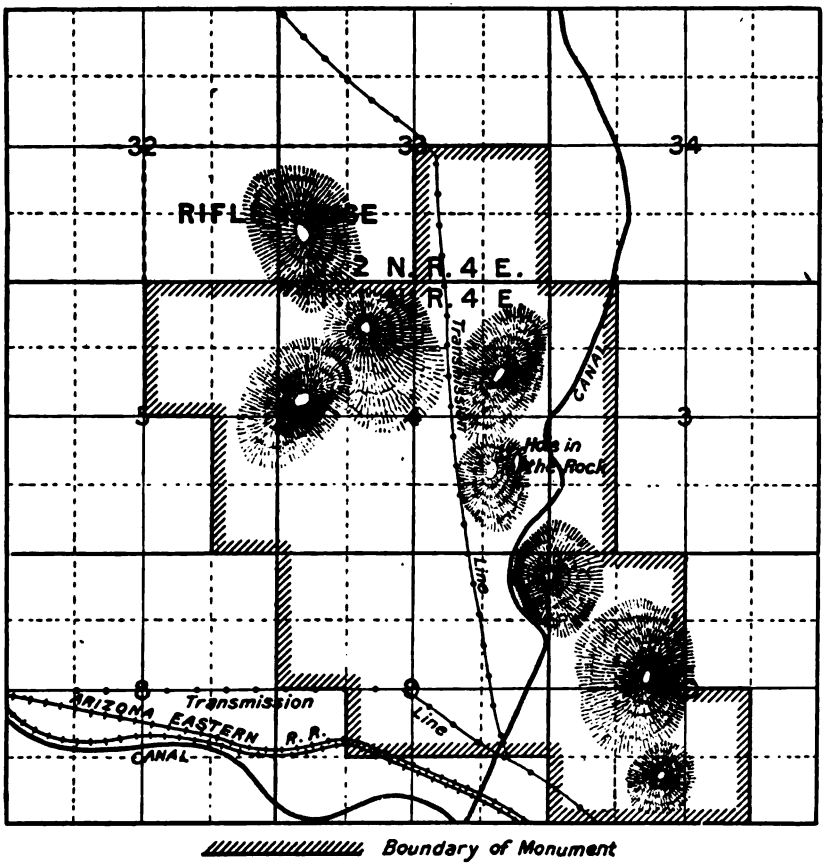
An interesting description of this national monument and vicinity is contained in Bulletin No. 50 of the Bureau of American Ethnology, which comprises results of explorations by Dr. Jesse Walter Fewkes, of that bureau, in 1909 and 1910.

These ruins are in an excellent state of preservation, their condition not having changed in the past 35 years. The houses are protected from the elements by the overhanging cliffs, and deterioration is very slow. No vandalism has occurred, as practically the only inhabitants in the vicinity are Indians, who refrain from molestation of the ruins in any manner.

PAPAGO SAGUARO NATIONAL MONUMENT.

This monument was created by proclamation of January 31, 1914, and embraces approximately 2,050 acres of rocky and desert land in Maricopa County, about 9 miles east of Phoenix, Ariz. Within the tract is found a splendid collection of characteristic desert flora, including many striking examples of giant cactus (saguaro) and many other interesting species of cacti, such as the prickly pear, Cholla, etc., as well as fine examples of the yucca palm, all of which are of great scientific interest and grow in this monument to great size and perfection. The saguaro is that variety of cactus which grows in a cylindrical form to a height of 30 or 35 feet, with from one to a dozen branches of the same character from the main stalk, generally near the top. There are also within the tract prehistoric pictographs which are found upon the faces of the rocks, adding to the interest of the reservation and to its ethnological and archæological value. Through the center of the tract, running northwest and southeast, is a ridge of low hills rising from the flat desert to a height of 150 to 200 feet. The rocks in the ridge have been worn considerably by the elements, resulting in numerous caves and a few openings extending entirely through the rocks. One of these openings, known locally as "Hole-in-the-rock," is an aperture some 15 feet high and 25 feet long with an amphitheater approach to the hole on each side. These approach rooms are about 30 feet square, with the overhanging rock for a roof in each case. The monument is visited by several thousand people each year as a picnic ground, as it is readily reached by automobile or team, over good roads, from Phoenix or Tempe, Ariz., distant respectively 9 and 3 miles. Phoenix is reached by rail by the Santa Fe, Prescott & Phoenix Railroad, a branch of the main line of

the Santa Fe Railway from Ash Fork, Ariz. Phoenix and Tempe are also reached by the Arizona & Eastern Railroad, which branches from the main line of the Southern Pacific Railway at Maricopa, Ariz. The monument is well located to be viewed in connection with a trip over the great irrigation system of the Salt River Valley, better known as the Roosevelt project of the Reclamation Service.



Papago Saguaro National Monument, Ariz., embracing the SE. ¼ of sec. 33, T. 2 N., R. 4 E.; W. ½ of W. ½ sec. 3, all sec. 4, NE. ¼ and E. ½ of SE. ¼, sec. 5, W. ½ and W. ½ SE. ¼ sec. 10, N. ½ N. ½ SE. ¼ and NE. ¼ of SW. ¼ sec. 9, T. 1 N., R. 4 E., all east of Gila and Salt River meridian, containing 2,050.43 acres.

DINOSAUR NATIONAL MONUMENT.

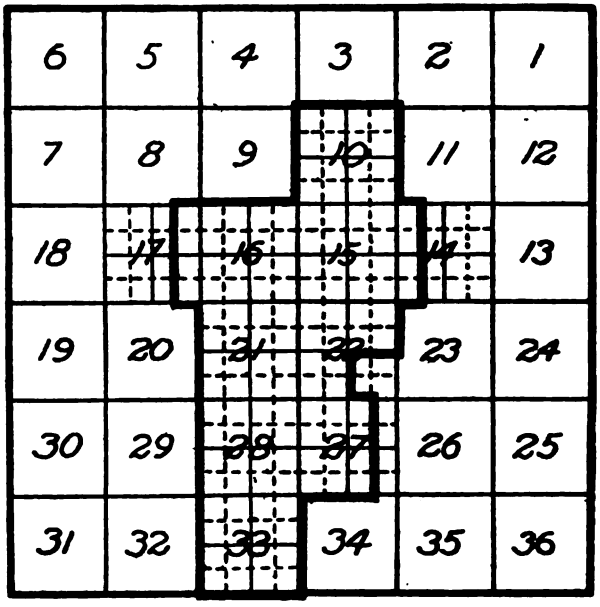
This national monument was created by proclamation dated October 4, 1915, and embraces 80 acres of land situated in Uinta County, northeastern Utah, east of Vernal, the same being the NW. ¼ of the SE. ¼ and the NE. ¼ of the SW. ¼, sec. 26, T. 4 S., R. 23 E., Salt Lake meridian. By this proclamation lands are reserved upon which is located an extraordinary deposit of dinosaurian and other gigantic reptilian fossil remains, of the Juratrias geologic period, which are of

great scientific interest and value, the object of creation of the monument being to prevent their unauthorized excavation and removal.

CINDER CONE NATIONAL MONUMENT.

The Cinder Cone National Monument was created by proclamation dated May 6, 1907. It is situated within the Lassen Peak National Forest, and with the adjacent area, embracing a lava field and Snag Lake and Lake Bidwell, is of scientific interest as illustrative of volcanic activity, and is of special importance in tracing the history of the volcanic phenomena of that vicinity.

This monument may be reached by old secondary roads from Fall River Mills, on Pit River, or from Susanville, on the Fernley-Lassen



Cinder Cone National Monument, within Lassen Peak National Forest, Cal., embracing part of T. 31 N., R. 6 E., Mount Diablo meridian; created May 6, 1907.

branch of the Southern Pacific Railway. The best route is by road from Red Bluff, Susanville, or Westwood, on the Southern Pacific Railway, or from Keddie, on the Western Pacific Railway, to Drake Hot Springs (now known as Drakesbad). From this point a good trail leads to the Cinder Cone National Monument, distant 12 miles.

Hotel and camping accommodations are furnished at Drakesbad in summer, and the round trip by saddle horse can easily be made in a day to the Cinder Cone, taking in Twin Lakes and Snag Lake en route.

LASSEN PEAK NATIONAL MONUMENT.

The Lassen Peak National Monument was created by proclamation dated May 6, 1907. It is situated within the Lassen Peak National Forest and marks the southern terminus of the long line of extinct volcanoes in the Cascade Range, from which one of the greatest

volcanic fields in the world extends, and is of special importance in tracing the history of the volcanic phenomena of that vicinity.

This monument covers sections 34 and 35, township 31 north, range 4 east, Mount Diablo meridian, and takes in the summit of Lassen Peak, now an active volcano.

The monument may be reached from all sides, but the main trail goes up the southwest shoulder of the mountain. The mountain may be reached from Red Bluff on the Southern Pacific Railway, via Red Bluff-Susanville Road to Morgan Springs and thence 10 miles up the Mill Creek trail; or one may go on to Drake Hot Springs and thence 11 miles by trail up Kings Creek to the summit. Morgan Springs and Drake Hot Springs may also be reached by auto or team from Keddie, on the Western Pacific Railway, or Susanville or Westwood, on the Fernley-Lassen Branch of the Southern Pacific. Morgan and Drake Springs have hotel accommodations in summer.

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Lassen Peak National Monument, within Lassen Peak National Forest, Cal., embracing part of T. 31 N., R. 4 E., Mount Diablo meridian; created May 6, 1901.

GILA CLIFF-DWELLINGS NATIONAL MONUMENT.

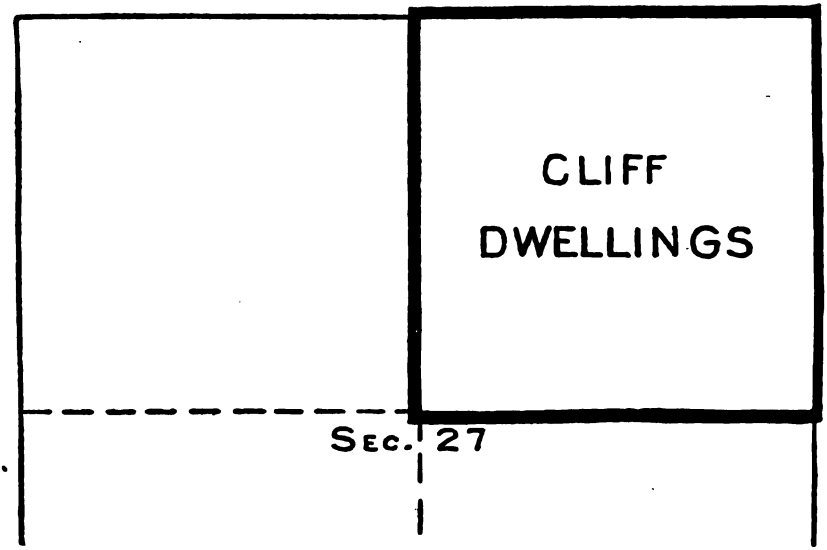
The Gila Cliff-Dwellings National Monument was created by proclamation dated November 16, 1907. These cliff-dweller ruins are neither very large nor very important, but are located in a district in which few prehistoric ruins are found.

The ruins are situated approximately 50 miles northwest of Silver City, N. Mex., and about 4 miles northwest of the Gila Hot Springs. The best way to reach them is by wagon and trail from Silver City via Pinos Altos.

The ruins are located in the mouth of a deep, rough canyon, known as the Cliff Dwellers Canyon, flowing into the West Fork of the Gila River from the south. They occupy four natural cavities in the base

of an overhanging cliff which is about 150 feet high and composed of a grayish yellow volcanic rock.

The largest cavity is nearly circular and about 50 feet in diameter. The arched rock forming the roof is about 10 feet above the center of the floor. In one corner is a small room 6 by 8 feet, built of rock and adobes and provided with a small entrance window. Natural archways lead into two smaller tributary cavities. These are divided into a number of small rooms by walls built of adobe and small stones which are in such a good state of preservation that finger imprints made in the adobe when the walls were built, can still be plainly seen. Above the small doorways and windows, pieces of timber were used which are perfectly preserved. In some of the higher walls holes can



Gila Cliff-Dwellings National Monument, within Gila National Forest, N. Mex., embracing NE. ¼ of sec. 27, T. 12 S., R. 14 W., New Mexico meridian; created November 16, 1907.

be seen where timbers which undoubtedly formed the joists for a second story have been burned out.

A fourth cavity, separate from the others, contains the walls of small rooms in a good state of preservation. There is still another cavity, high on the face of the cliff, which has never been explored. As the cliff overhangs, it is impossible to enter it by means of suspended ropes. It can be entered only by means of a ladder.

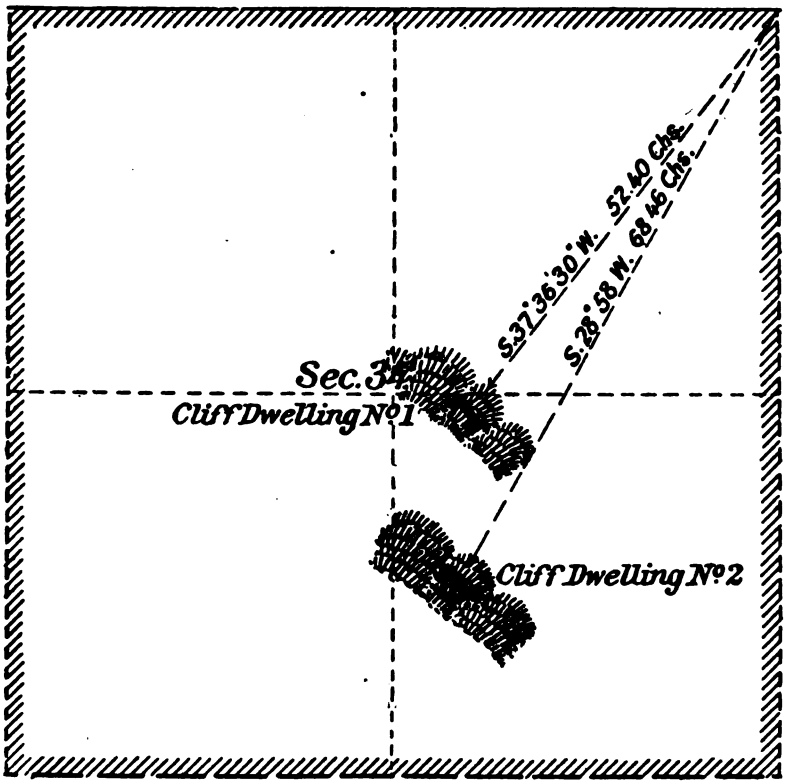
Part of the outer wall, which at one time evidently closed the openings into these cavities, is still partially preserved. The remainder shows that it was intended for defensive purposes, as small windows are the only openings.

When these cliff dwellings were first discovered by prospectors and hunters in the early seventies, a number of relics in the shape of sandals, baskets, water vessels, cooking utensils, spears, etc., were found. Corncobs can still be found in numbers. Some of the walls have been destroyed by vandals.

A mummy was found here a number of years ago which eventually was placed in the Smithsonian Institution. Another mummy, found in 1912, also was forwarded to the Smithsonian Institution.

TONTO NATIONAL MONUMENT.

The Tonto National Monument was created by proclamation dated December 19, 1907, and is located in Gila County, Ariz. Situated only 1 mile south of the ocean-to-ocean highway, 80 miles east of



Tonto National Monument, unsurveyed sec. 34, T. 4 N., R. 12 E., Gila and Salt River meridian, Ariz., containing 640 acres; created December 19, 1907.

Phoenix, 40 miles north of Globe, Ariz., and about 4 miles east of the Roosevelt Dam, the Tonto National Monument is one of the most easily accessible ruins of the vanished race of cliff dwellers. From the main road between Globe and Phoenix, Ariz., automobiles may be driven over a good branch road to within half a mile of the nearest of the groups of cliff dwellings.

The southern group of dwellings is located in a cavern formed by the peculiar weathering of argillite rock, which forms a perpendicular or overhanging wall, with a steep talus slope below, so plentifully studded with cholla cactus as to suggest their having been planted there by the cliff dwellers as a defense against their enemies. This natural cavern is about 125 feet across and the ledge upon

which the dwellings are built is 35 feet wide at the widest point. From the outer edge of the footwall to the overhanging roof of the cavern the perpendicular distance is 30 or 40 feet. The dwelling, evidently communal, contained originally about 15 chambers, each from 12 to 16 feet square and 6 feet in height. Ten chambers are in a fair state of preservation, and most of these are two or three storied, depending upon whether or not the inhabitants lived in the space between the second artificial roof and the cavern roof above. The construction of the dwellings shows careful planning and no mean knowledge of the art of masonry. The walls are of flat rocks cemented together with a gravelly adobe. The ceilings are cleverly constructed of wooden poles with their ends deeply embedded in the side walls. A solid layer of fibers from the Sajauro or giant cactus rests transversely upon the poles, and upon them is spread about 4 inches of adobe, forming the floor of the chamber above. Small openings, or doors, generally about 2 by 4 feet, provided communication between chambers on the same level, but in only one instance (noted in the northern group of dwellings) is there an opening in the ceiling of a chamber to allow egress to the chamber above. There are occasional small holes in the side walls of the inner chambers, apparently for the purpose of ventilation, lighting, or communication, but so-called "arrow holes" in the outer walls, through which the beleaguered inhabitants are popularly supposed to have shot arrows at storming parties of their enemies, have every appearance of being simply apertures left by the removal of the roofing poles. Fragments of metates, or primitive stone utensils for grinding corn, and even corncobs, are to be found among the ruins.

The northern group of dwellings includes two caverns. One contains about 12 rooms in a better state of preservation than those of the southern group, although badly vandalized. One large interior chamber is in a perfect state of preservation. The other cavern of this group contains eight single-storied chambers, poorly preserved.

GRAND CANYON NATIONAL MONUMENT.

A considerable portion of the area set aside by the proclamation creating this national monument is covered by three different proclamations, one of which created the Grand Canyon Forest Reserve, one the game preserve embracing that part of the national forest north of the river, and the third the monument proclamation. The monument now comprises a tract of 800,000 acres lying within the Tusayan and Kaibab National Forests, and is partly coextensive with the Grand Canyon Game Preserve. It is believed that the most wonderful portion of the canyon is contained within the present limits of the national monument and game preserves.

The Grand Canyon of the Colorado was discovered in the year 1540 by Don Garcia Lopez de Cardenas, a captain under Coronado. The pioneer work in its scientific exploration was done between the years 1869 and 1882 by the late Maj. John Wesley Powell, United States Army, and formerly Director of the United States Geological Survey. In 1902 it became accessible by railroad and is now visited by 100,000 people each year.

All experienced travelers, with one accord, have given the Grand Canyon a high place among the great wonders of the world. It con-

sists of a mile-deep gorge cut through a hundred miles of high forested plateau, and is principally remarkable for its brilliant and variegated color effects and the extraordinary sculpturing of its interior by ages of erosive action. The lateral canyons contain many cliff dwellings. While the main canyon is more than 10 miles wide at all points, the river itself runs through an inner chasm of solid granite and contains many rapids which have claimed a number of lives and have not been often successfully navigated. A cable ferry crosses the river at one point.

That part of the Grand Canyon National Monument south of the river, which is the part most often visited, is administered by the United States Forest Service as part of the Tusayan National Forest. The forest supervisor's headquarters is at Williams, Ariz., and the local forest ranger is stationed at Rowe Well, 3½ miles southwest of the railroad terminal. To preserve the scenic value of points along the rim, especially thorough protection is provided against forest fires.

The easiest way to reach the Grand Canyon is by way of the Santa Fe Railway, which maintains a branch line extending from its main transcontinental line at Williams, Ariz., to the south rim of the canyon itself. At this point first-class hotel facilities and livery service are afforded, while excellent roads and trails lead into the canyon and to points along the rim in either direction.

Transcontinental motorists are also visiting the canyon in increasing numbers. Good branch roads lead to the canyon from the main ocean-to-ocean highway.

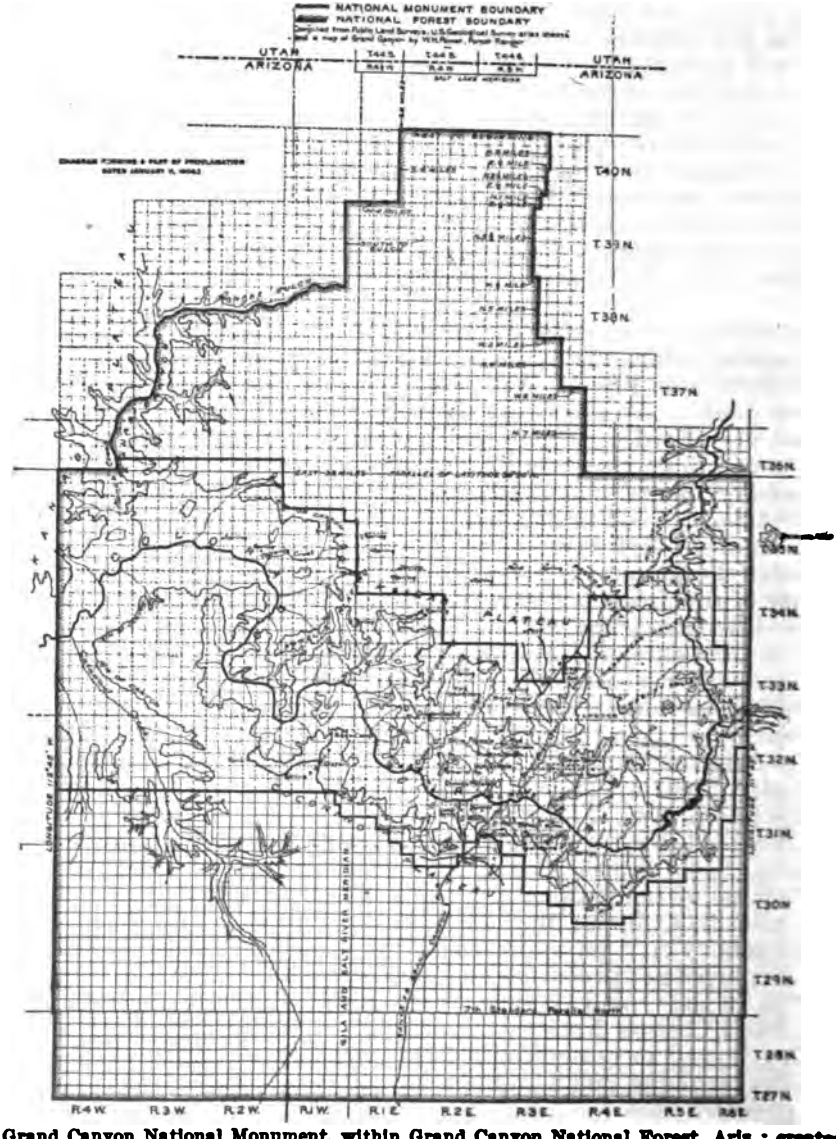
Under the protection given by the Forest Service, under the authority of the proclamation establishing the Grand Canyon National Game Preserve, game animals have steadily increased. The preserve is now estimated to contain 10,000 head of blacktail deer and a large number of bighorn or mountain sheep. Mountain lions and other predatory animals are systematically destroyed by forest officers.

Steps were taken to create a national park of the Grand Canyon of the Arizona, and a bill (H. R. 6331) providing for such purpose was introduced in Congress April 20, 1911. The bill, however, did not become a law. The Association of American Geographers has recommended that the above-mentioned park be designated as Powell National Park, and the Geological Society of America has approved the naming of the national park in the Grand Canyon of the Colorado after its explorer, Maj. John Wesley Powell.

The sundry civil act approved March 4, 1909, appropriated $5,000 for the purpose of procuring and erecting on the brink of the Grand Canyon in the Grand Canyon Forest Reserve (within the limits of the Grand Canyon National Monument) a memorial to Maj. John Wesley Powell in recognition of his distinguished public service as a soldier, explorer, and administrator of Government scientific work, and provided that the design for the memorial and the site should be approved by the Secretary of the Interior. Thereafter the Secretary designated as an advisory committee Dr. W. H. Holmes, Chief of the Bureau of Ethnology, Dr. C. D. Walcott, Secretary of the Smithsonian Institution, and Col. H. C. Rizer, chief clerk of the United States Geological Survey, to assist in determining the character of the monument and the selection of the site. This committee

submitted designs prepared by Mr. J. R. Marshall, of Washington, D. C., and his plans were referred to the Commission of Fine Arts and have received its approval.

Subsequently, in 1915, at the instance of the Secretary of the Interior, these plans were revised in certain respects by Mr. Mark



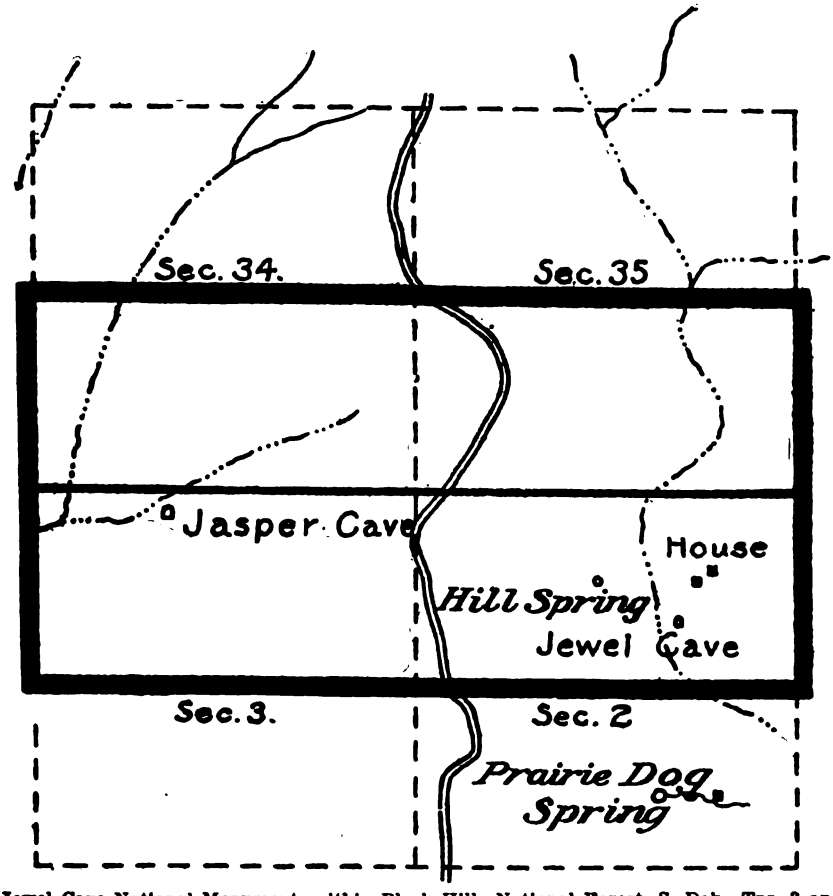
Grand Canyon National Monument, within Grand Canyon National Forest, Ariz.; created January 11, 1908.

Daniels, general superintendent and landscape engineer of national parks, and Mr. Walter Ward, engineer of the Reclamation Service, was placed in charge of actual construction work on the memorial. This work was commenced late in the summer of 1915, and was completed on October 26, 1915.

JEWEL CAVE NATIONAL MONUMENT.

Jewel Cave National Monument was created by proclamation dated February 7, 1908.

Jewel Cave, which is located 13 miles west and south of Custer, the county seat of Custer County, S. Dak., was discovered on August 18, 1900, by two prospectors, Albert and F. W. Michaud, whose attention was attracted by the noise of wind coming from a small hole in the



Jewel Cave National Monument, within Black Hills National Forest, S. Dak., Tps. 3 and 4 S., R. 2 E., Black Hills meridian; created February 7, 1908.

limsetone cliffs on the east side of Hell Canyon. In the hope of discovering some valuable mineral and the source of the wind, these men, in company with one Charles Bush, enlarged the opening.

The cave, as far as known, is located in limestone formation and is apparently the result of action of water. A prominent geologist who visited this cave believes it to be an extinct geyser channel. The main passage has been explored a distance of over 3 miles, although it has been opened up for visitors only 1½ miles, a short distance beyond Milk River, which is a stream flowing through a white limestone, which gives the water the appearance of milk.

The limits of the main passage and side galleries are as yet unknown. Explorations have been carried in a northerly direction and vertically 100 feet below the entrance.

On either side of the main passage are side galleries and chambers of various sizes. The first chamber, or gallery, is lithographic limestone and resembles the Gothic style of architecture. About 500 feet from the entrance, the walls and roofs of a number of the chambers are lined with a thick crystalline calcite and the floor is of calcite and manganese.

Within the different chambers one may see different colored chert. It varies in color, some having a peculiar light-green tint, also dark green and bronze. The surface of the rock is smooth and should take a high polish.

The chambers are connected with narrow passages generally, although wide passages are sometimes found. The narrow passages are very picturesque. The "box work" or honeycomb crystallization is very attractive. The color ranges from a light brown to a deep chocolate shade, and the boxlike cavities, covered with minute crystals, stand in relief from the ground mass.

Geodes of various size and shape are found in the walls and passageways, galleries, and chambers. The brilliancy of some of these cavities is very beautiful.

The explorers have been careful observers of the action of the wind within the cave. They have discovered that ordinarily the wind blows in and out of the cave for regular periods, the periods of blowing in and out being 15 hours each, although they have known the periods to be of 72 hours' duration. Other wind passages have been discovered in the vicinity of the cave.

The cave is a wonderful creation of nature and worthy of many hours of study. As yet the cave has not been robbed of its beautiful specimens. A good automobile road leads to the cave from Custer, about 12 miles distant. Good spring water is plentiful near the cave.

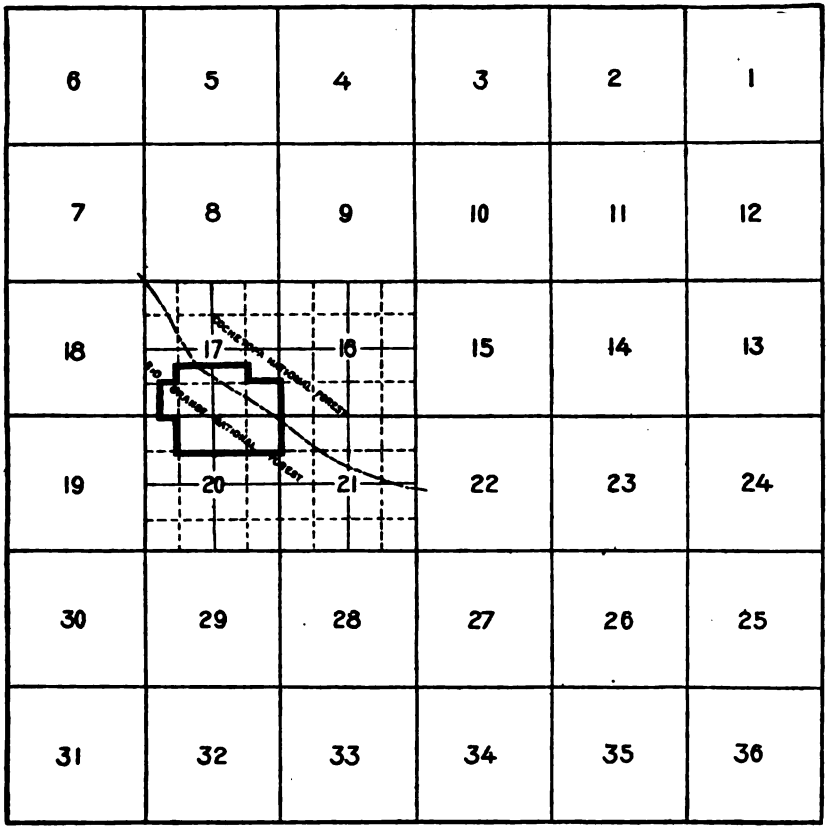
WHEELER NATIONAL MONUMENT.

Wheeler National Monument was created by proclamation of December 7, 1908, and is located on the east slope of the divide between the head of the West Fork of Bellows Creek on the south side of the range and the head of the South Fork of Saguache Creek on the north side of the range and about 1 mile southeast of Half Moon Pass, in sections 17 and 20, township 42 north, range 2 east, New Mexico principal meridian, Mineral County, Rio Grande National Forest, Colo.

The tract lies on the southern slope of the ridge which forms the crest of the Continental Divide. It is traversed from north to south by numerous deep canyons with very precipitous sides, the intervening ridges being capped by pinnacle-like rocks, making it practically impossible to cross the tract from east to west, even on foot. There are also many crevices cutting the ridges transversely, making an intricate network of ravines separated by broken, precipitous ledges and broken mesas.

It is probable that the formation found here is the result of a succession of outpourings of lava and showers of volcanic ash which have left a series of nearly horizontal strata of varying degrees of

hardness. Numerous pebbles and breccia of a flint-like rock are embedded in the softer lavas which were probably gathered up by the flowing lava mud from the original bedrock. The formation is for the most part scoriaceous tufa and trachyte, with some rhyolite. The effect of erosion on this formation has been to cut it into sharply defined forms of many kinds. The harder broken rocks embedded in the lavas have acted as veritable chisels, greatly accelerating erosive action and making the lines and angles more sharply defined than



Wheeler National Monument, within Cochetopa and Rio Grande National Forests, Colo., T. 42 N., R. 2 E., New Mexico meridian; created December 7, 1908.

would be the case in ordinary weathering. This erosion is still going on at a remarkably rapid rate, making the place very interesting from the geological point of view.

The fantastic forms resulting from the rapid erosion make this spot one of exceptional beauty. The numerous winding canyons, broken ridges, pinnacles, and buttes form striking and varied scenes.

From the most reliable data it is believed that the ill-fated expedition of John C. Fremont, in 1848, reached this immediate vicinity, when disaster came upon the party, compelling it to turn back. Skeletons of mules, bits of harness, and camp equipage are found here, lending force to the recorded data.

In order to reach the monument it is necessary to use saddle horses from Wagon Wheel Gap or Creede, points on the Denver & Rio Grande Railroad. From these places the monument may be reached by two different routes; one by leaving the Rio Grande a short distance above Wagon Wheel Gap and following the old wagon road into Blue Creek Park, thence following the trail around to the monument by the way of the head of East Bellows Creek. By this route the distance is approximately 17 miles over a fairly good trail. The second route is to follow down the Rio Grande on the north side from Creede to about 1 mile below Wason, or 3 miles below Creede, thence taking the Forest Service trail, which is posted for the entire distance from where it leaves the river bottom below Wason to the monument. This is a good trail, and the distance is about 13 miles.

OREGON CAVES NATIONAL MONUMENT.

The Oregon Caves National Monument was created by proclamation of July 12, 1909.

The Oregon Caves, or "Marble Halls," of Josephine County, discovered in 1874, are located in the Siskiyou National Forest about 30 miles south of Grants Pass in Cave Mountain, a peak of the Greyback Range that divides the headwaters of the Applegate and Illinois Rivers and connects with the Siskiyou Mountains near the north line of California.

Leaving the Southern Pacific Railway at Grants Pass, a fair wagon and automobile road runs as far as the Stephens Ranch on upper Williams Creek, a distance of 26 miles. From this point to the caves the trip must be made on horseback or afoot over a very good forest trail a distance of about 10 miles.

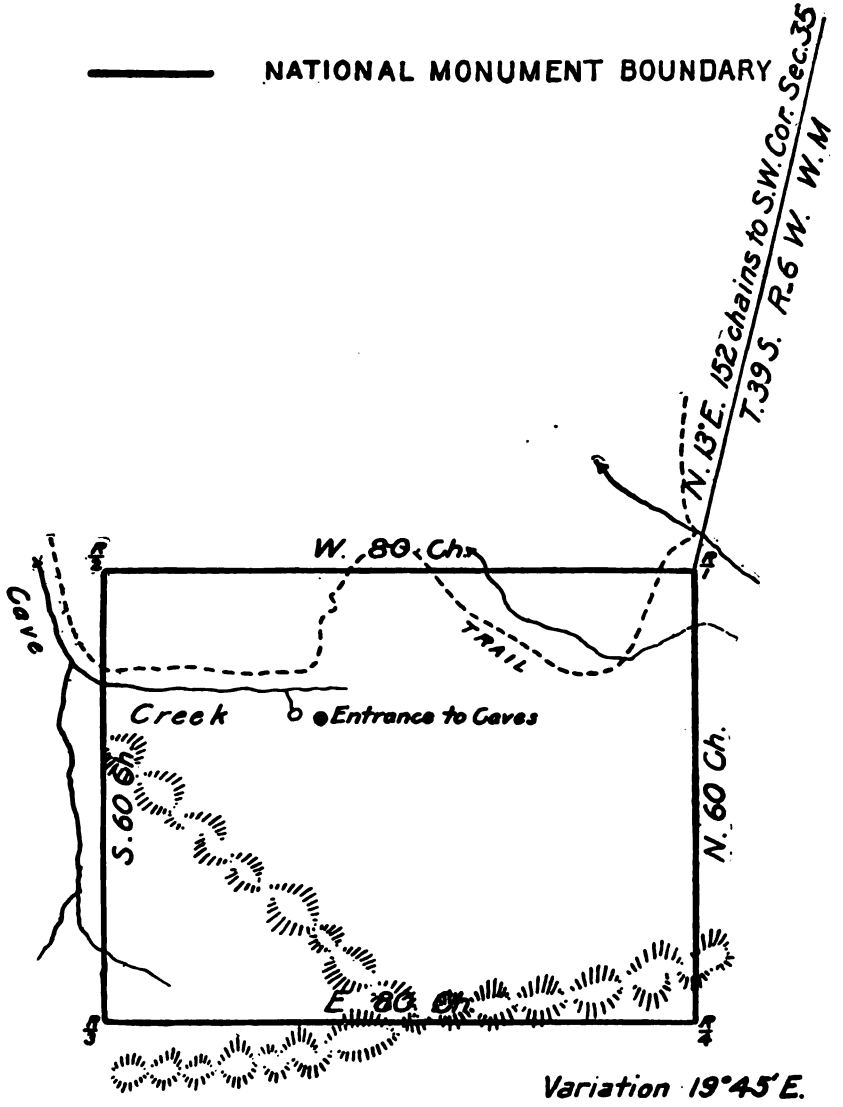
Cave Mountain, the peak which contains these caves, rises to an elevation of about 6,000 feet and is of limestone formation. The main openings around which the national monument has been created are at an elevation of 4,000 feet, but the entire mountain side of 5 or 6 miles shows caverns of various sizes, and in all probability throughout its inferior is honeycombed like the portion that has been explored.

These caves are more of a series of galleries than of roomy caverns, though many beautiful rooms have been discovered, while miles of galleries have been visited; but there are thousands of passageways leading in all directions—partly closed by stalactites—that have never been opened, and with the distant and unexplored openings on the opposite side of the mountain the magnitude of the Oregon Caves can be said to be practically unknown.

Many small streams are found at different elevations, and larger bodies of running water can be heard in pits bottomless so far as measured (by 300-foot line). This running water probably accounts for currents of wind that in some of the galleries blow so hard as to extinguish an open light at once.

The lime deposits take many beautiful forms—massive pillars, delicate stalactites of alabaster whiteness with the crystal drop of water carrying its minute deposit of lime, from which they are formed, and broad sheets resembling drapery with graceful curves and waves that were certainly made by varying currents of wind during formation.

The Forest Service has rebuilt and improved the trails leading to the caves from each side of the divide, in order to more easily protect the valuable forest surrounding and to make the caves more accessible to tourists.

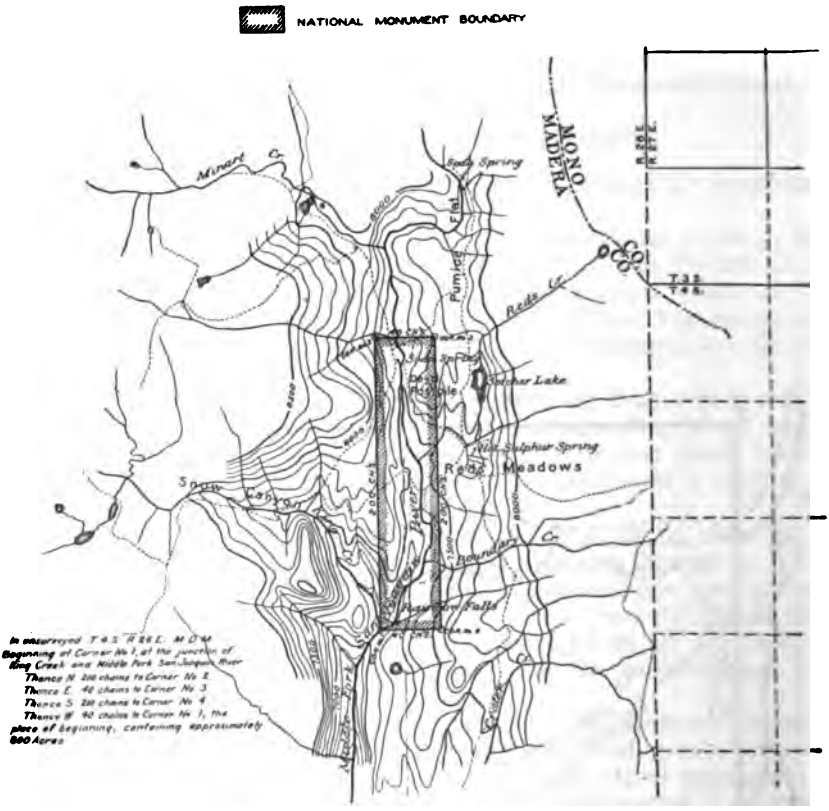


Oregon Caves National Monument, within Siskiyou National Forest, Oreg.

DEVIL POSTPILE NATIONAL MONUMENT.

This national monument was created by proclamation of July 6, 1911, and is located in the high Sierras a few miles west of the main crest of the range in the northeastern end of Madera County, in the Sierra National Forest.

The Devil Postpile consists of a spectacular mass of hexagonal basaltic rock columns, about 2 feet each in diameter and varying up to 50 feet in height, which are exposed on one side on the face of a nearly perpendicular cliff. These are laid down in the form of an immense pile of posts, and while there are similar formations in different parts of the country this is especially prominent, being one of the most noted of its kind on the continent, and said to rank with the famous Giants Causeway on the coast of Antrim, in the north of Ireland. A mile or so below the Postpile and within the limits of



Devil Postpile National Monument, Cal.

the national monument is a beautiful waterfall, known as Rainbow Fall, in the chasm of the upper Middle Fork of the San Joaquin River. The fall, while not so high, resembles in appearance the Vernal Falls of the Merced River in Yosemite National Park, and one of the few of its kind on the continent.

Within the national monument there is also a picturesque meadow which affords a fine camp site for travelers and from which the Postpile is in sight, while in the edge of the river near this meadow is a hot sulphur spring which lends much interest to the locality.

The national monument is surrounded by some of the grandest scenery of the Sierra Nevada Range, while forests of fir, lodge pole and mountain pine clothe the surrounding slopes. Its beauties and

wonders will well repay the difficulties which are imposed upon the trip by the remoteness and relative inaccessibility of its location.

The Devil Postpile National Monument is most easily reached over the crest of the range from the east. From Laws, on the Southern Pacific, there is an automobile stage through Bishop to Mammoth, which lies at the foot of the range, and from Mammoth animals can be engaged for the trip by trail which takes only half a day over Mammoth Pass to the national monument. The latter can also be reached from Fresno, in the San Joaquin Valley on the west, either by automobile stage to Northfork, Madera County, thence by a secondary road, passable for automobiles for some 10 miles farther, some 30 miles to Granite Creek, near the junction of the forks of the San Joaquin River, and from thence by trail only some 25 miles additional, or by the Southern Pacific and the San Joaquin & Eastern Railroads from Fresno to Cascada (or Big Creek, as the post office is called), where animals can be hired for the trip by trail over Kaiser Pass, or around the western flank of the Kaiser Ridge, about a two days' trip each way.

MOUNT OLYMPUS NATIONAL MONUMENT.

This monument as originally set aside by presidential proclamation of March 2, 1909, contained approximately 608,640 acres. It was created for the purpose of preserving many objects of great and unusual scientific interest, embracing numerous glaciers, and the territory has also been from time immemorial the summer range and breeding ground of the Olympic elk, a species which is rapidly decreasing in numbers. A bill was introduced in Congress on July 15, 1911, providing for the setting aside as a national park the same tract of land as was set aside by proclamation of the President creating the Mount Olympus National Monument.

It was reduced by presidential proclamation of April 17, 1912, to 608,480 acres in order to permit certain claimants to land therein to secure title to the land. By proclamation of May 11, 1915, the monument was further reduced, and the lands eliminated thereby made part of the Olympic National Forest, in order to permit of their development, the area eliminated not being essential to the purposes for which the monument was originally established. The present area of the monument is 299,370 acres. The proclamation of May 11, 1915, reads:

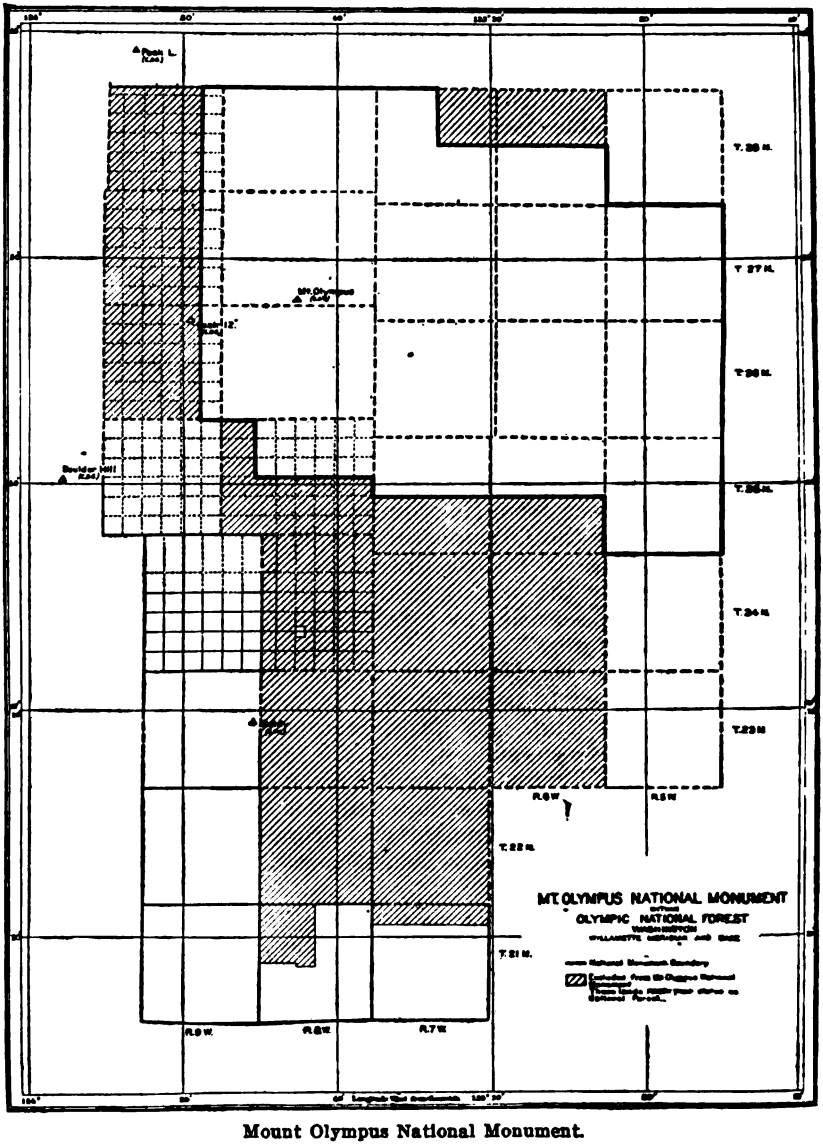
I, Woodrow Wilson, President of the United States of America, by virtue of the power in me vested by section 2 of the act entitled, "An act for the preservation of American antiquities," approved June 8, 1906 (34 Stat., 225), do hereby proclaim that the boundaries of the Mount Olympus National Monument as fixed and defined by proclamation of March 2, 1909 (35 Stat., 2247), and as modified by proclamation of April 17, 1912 (37 Stat., 1737), are hereby further modified and established as shown on the diagram forming a part hereof, and said national monument, as so modified and established, shall be administered in accordance with the aforesaid proclamation of March 2, 1909.

It is not intended that the lands eliminated from the Mount Olympus National Monument by this proclamation shall be eliminated from the Olympic National Forest, as established by proclamation of March 2, 1907 (34 Stat., 3306), but such lands shall continue subject to the reservation for forest purposes therein made.

In witness whereof I have hereunto set my hand and caused the seal of the United States to be affixed.

Done at the city of Washington this 11th day of May in the year of our
[SEAL.] Lord one thousand nine hundred and fifteen, and of the independence of the United States the one hundred and thirty-ninth.

There are a number of different routes by which the Mount Olympus National Monument may be reached, all of which require some travel by trail. The most convenient and quickest route, though not the shortest in point of miles, by which a most excellent view can be had of Mount Olympus and scenic surroundings—about 6 miles



Mount Olympus National Monument.

air line—is by way of Port Angeles and the Sol Duc Hot Springs, as follows: Leave Seattle on a Puget Sound steamer about midnight, arriving in Port Angeles about 7 the following morning. Take automobile stage for Sol Duc Hot Springs, 45 miles, arriving about noon. Monument boundary about 2 miles by trail up river, but close

view of Mount Olympus not possible until Soleduck-Hoh divide is reached, about 11 miles by trail from Sol Duc Hotel.

Another route, and the most practicable in case a trip through the monument from north to south is desired, is by way of Port Angeles and the Elwha and Queniult, coming out by way of Queniult Lake and Hoquiam. From Port Angeles to the Elwha River bridge on the Lake Crescent road is a little under 11 miles, the morning stage reaching that point about 9.30 a. m. Horse or foot travel must then be resorted to over a mountain trail of more than ordinary steep pitches, exasperating ups and downs, and, on the Queniult side, some very narrow and rather dangerous grades for a total through distance to Queniult Lake of about 70 miles. A side trip to the Elwha-Queets divide at the base of Mount Olympus would add 12 miles more. Other trail routes approach close to portions of the monument, but do not lead through or into the highest and most scenic interior, such travel being possible only on foot and by merely picking one's way along rough snowcapped ridges or through creek bottoms, along elk trails, etc. The two best trails from the east, or Hoods Canal, side are up the Dosewallips River and the North Fork of Skokomish River. The Dosewallips route is accessible from Seattle as follows: Take steamship *Potlatch* from Seattle at 9 a. m., reaching Brinnon about 2 p. m. A wagon road extends up the Dosewallips River 7 miles from Brinnon, and quite satisfactory horse trail continues to Sulphur Springs, 13 miles farther, which lands one within 5 or 6 miles of the monument boundary. Travel beyond that point is only possible on foot and with considerable personal exertion and rough going. At least 30 miles of very rough travel would be necessary to reach Mount Olympus, the highest point, 8,200 feet.

The North Fork Skokomish route may be reached from Seattle as follows: Take steamship *Potlatch* from Seattle at 9 a. m., arriving at Hoodsport about 4.30 p. m. Automobile stage to Lake Cushman, 9 miles, same evening. A fair horse trail from the hotels at that point reaches the head of the river a few miles inside the monument boundary, a distance of nearly 20 miles, from which point an excellent view may be had of the Mount Anderson country. Cross-country travel to Mount Olympus is, however, impossible from this point, excepting on foot and with unusually careful and tedious mountain climbing.

The only feasible route from the west side is up the Hoh River over a horse trail, which is quite satisfactory in dry weather, extending 40 miles from the settlement of Forks. Forks is reached by automobile road from Port Angeles and from Clallam Bay, being about 62 miles from the former and about 30 from the latter. The horse trail on the upper Hoh ends at 4 or 5 miles inside the monument and perhaps 10 miles by a rough and somewhat dangerous foot travel route from the top of Mount Olympus.

BIG HOLE BATTLE FIELD MONUMENT.

This monument, which is under jurisdiction of the War Department, was created by presidential proclamation of June 23, 1910, by which 5 acres of unsurveyed land, embracing the monument, in Beaverhead County, Mont., was reserved for military purposes for use in protecting same. It commemorates a battle fought on Au-

gust 9, 1877, between a small force of United States troops and a much larger number of Nez Perce Indians, which ended in complete rout of the Indians. The nearest settlement to the monument is the town of Gibbons, Beaverhead County, Mont., which is reached by stage via Wisdom from Divide, Mont., a distance of about 45 miles. Divide is a station on the Oregon Short Line Railroad, some 25 miles south of Butte, Mont.

CABRILLO NATIONAL MONUMENT.

The Cabrillo National Monument was created October 14, 1913, at Point Loma, of a small tract of land containing 21,910 square feet which lies within the military reservation at Fort Rosecrans, Cal., the same being of historic interest because of the discovery of the territory now partly embraced in the State of California, by Juan Rodriguez Cabrillo, who at this point first sighted land on September 28, 1542.

BIRD RESERVES.

All of the bird reserves have been created through reference from the Interior Department to the President of forms of Executive orders providing therefor. These reserves are regarded as in all essential particulars reservations of public lands for public use or other purposes, for which there are numerous precedents. The first specific act of Congress providing for the protection of birds by bird reserves created by Executive order was introduced by Hon. John F. Lacy, of Iowa, and became a law on June 28, 1906. (34 Stat., 536.) This act makes it unlawful to kill birds, to take their eggs, or to willfully disturb birds upon the reservations, and it provides a fine of not exceeding $500 or imprisonment for not exceeding six months, or both fine and imprisonment, for each conviction secured. This law was substantially reenacted in the new penal code approved March 4, 1909 (35 Stat., 1104), in the following language:

SEC. 84. Whoever shall hunt, capture, willfully disturb, or kill any bird of any kind whatever, or take the eggs of any such bird, on any lands of the United States which have been set apart or reserved as breeding grounds for birds by any law, proclamation, or Executive order, except under such rules and regulations as the Secretary of Agriculture may from time to time prescribe, shall be fined not more than $500 or imprisoned not more than six months, or both.

The reservations now existing are 70 in number, of which 68 are being administered under the direction of the Biological Survey, Department of Agriculture. The Pribilof Reservation in Alaska is administered by the Bureau of Fisheries of the Department of Commerce and the Canal Zone Reservation, Panama, by the Isthmian Canal Commission.

Bird reserves created.

Name of reservation.	Date.	Location.	Area.
Pelican Island	Mar. 14, 1903	East Florida coast	5.50 acres.
Breton Island	Oct. 4, 1904 Nov. 11, 1905	Southeast coast of Louisiana	Unknown.
Stump Lake	Mar. 9, 1905	North Dakota	27.39 acres.
Huron Islands	Oct. 10, 1905	Lake Superior, Mich	Unknown.
Siskiwit Islands	do	do	Do.
Passage Key	do	Tampa Bay, Fla	36.57 acres.
Indian Key	Feb. 10, 1906	do	90 acres.

Bird reserves created—Continued.

Name of reservation.	Date.	Location.	Area.
Tern Islands	Aug. 8, 1907	Mouths of Mississippi River, La.	Unknown.
Shell Keys	Aug. 17, 1907	South Louisiana coast	Do.
Three Arch Rocks	Oct. 14, 1907	West Oregon coast	Do.
Flattery Rocks	Oct. 23, 1907	West Washington coast	Do.
Quillayute Needles	....do	....do	Do.
Copalis Rock	....do	....do	Do.
East Timbalier Island	Dec. 7, 1907	South Louisiana coast	Do.
Mosquito Inlet	Feb. 24, 1908	East Florida coast	Do.
Tortugas Keys	Apr. 6, 1908	Florida Keys, Fla.	Do.
Klamath Lake	Aug. 8, 1908	Oregon and California	Do.
Key West	....do	Florida Keys, Fla.	Do.
Lake Malheur	Aug. 18, 1908	Oregon	Do.
Chase Lake	Aug. 28, 1908	North Dakota	Do.
Pine Island	Sept. 15, 1908	West Florida coast	Do.
Matlacha Pass	Sept. 26, 1908	....do	Do.
Palma Sola	....do	....do	Do.
Island Bay	Oct. 23, 1908	Florida	Do.
Loch Katrine	Oct. 26, 1908	Wyoming	Do.
Hawaiian Islands	Feb. 3, 1909	Hawaii	Do.
East Park	Feb. 25, 1909	California	Do.
Cold Springs	....do	Oregon	Do.
Shoshone	....do	Wyoming	Do.
Pathfinder	....do	....do	Do.
Bellefourche	....do	South Dakota	Do.
Strawberry Valley	....do	Utah	Do.
Salt River	....do	Arizona	Do.
Deer Flat	....do	Idaho	Do.
Minidoka	....do	....do	Do.
Willow Creek	....do	Montana	Do.
Carlsbad	....do	New Mexico	Do.
Rio Grande	....do	....do	Do.
Keechelus Lake	....do	Washington	Do.
Kachess Lake	....do	....do	Do.
Clealum Lake	....do	....do	Do.
Bumping Lake	....do	....do	Do.
Conconully	....do	....do	Do.
Bering Sea	Feb. 27, 1909	Alaska	Do.
Pribilof	....do	....do	Do.
Tuxedni	....do	....do	Do.
Farallon	....do	California	Do.
Culebra	....do	Porto Rico	Do.
Yukon Delta	....do	Alaska	Do.
St. Lazaria	....do	....do	Do.
Bogoslof	Mar. 2, 1909	....do	Do.
Clear Lake	Apr. 11, 1911	California	Do.
Forrester Island	Jan. 11, 1912	Alaska	Do.
Hazy Islands	....do	....do	Do.
Niobrara	....do	Nebraska	[1] 14,640 acres.
Green Bay	Feb. 21, 1912	Wisconsin	1.87 acres.
Chamisso Island	Dec. 7, 1912	Alaska	Unknown.
Pishkun	Dec. 17, 1912	Montana	Do.
Desecheo Island	Dec. 19, 1912	Porto Rico	Do.
Gravel Island	Jan. 9, 1913	Wisconsin	Do.
Aleutian Islands	Mar. 3, 1913	Alaska	Do.
Canal Zone	Mar. 19, 1913	Panama	Do.
Walker Lake	Apr. 21, 1913	Arkansas	Do.
Petit Bois Island	May 6, 1913	Alabama and Mississippi	Do.
Anaho Island	Sept. 4, 1913	Nevada	247.73 acres.
Smith Island	June 6, 1914	Washington	Unknown.
Dungeness Spit	Jan. 20, 1915	....do	226.02 acres.
Ediz Hook	....do	....do	[1] 83 acres.
Mille Lacs	May 14, 1915	Minnesota	Unknown.
Big Lake	Aug. 2, 1915	Arkansas	Do.

BIRD RESERVES ENLARGED, REDUCED, AND ABOLISHED.

Pelican Island	Jan. 26, 1909	Florida (enlarged)	Unknown.
Mosquito Inlet	Apr. 2, 1909	....do	Do.
Cold Springs	Nov. 25, 1911	Oregon (enlarged)	Do.
Clear Lake	Jan. 13, 1912	California (reduced)	Do.
Minidoka	Feb. 21, 1912	Idaho (enlarged)	Do.
Niobrara	Nov. 14, 1912	Nebraska (enlarged)	[1] 15,253.7 acres.
Deer Flat	Apr. 21, 1915	Idaho (reduced)	Unknown.
Klamath Lake	May 14, 1915	Oregon and California (reduced)	Do.
Blackbeard Island	May 25, 1915	Georgia (abolished)	Do.

[1] Approximate area.

As appears from this list, these reservations are scattered between Alaska and Porto Rico. After careful consideration, based upon representations made by this department, the Isthmian Canal Commission secured an Executive order for the protection of the native birds within the zone, which in its punitive features conforms to section 84 of the United States Penal Code. Jurisdiction over the Canal Zone Reservation is, however, retained by the Isthmian Canal Commission instead of being placed with the Department of Agriculture, as is the case in other Government bird reserves.

The Niobrara Reservation, Nebr., which was created by Executive order dated January 11, 1912, has been enlarged by a second order, dated November 14, 1912, so as to include within its boundaries about 614 acres, covering the old parade ground of the Fort Niobrara Military Reservation, including a spring of fresh running water and some of the military buildings and barracks which could be used for stables and for residence purposes by a custodian. This additional tract has been fenced and small herds of buffalo, elk, and deer, donated by J. W. Gilbert, a citizen of Nebraska, have been permanently domiciled therein, and it is believed that the climate and natural environment will insure the healthful and rapid increase of all of these most valuable of the larger native mammals.

Active administrative work by the Agricultural Department upon all of the reserves within its jurisdiction, which in the past have been in serious need of efficient warden service, has been most satisfactory.

APPENDIX.

[PUBLIC—No. 209.]

An Act For the preservation of American antiquities.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any person who shall appropriate, excavate, injure, or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the Government of the United States, without the permission of the Secretary of the department of the Government having jurisdiction over the lands on which said antiquities are situated, shall, upon conviction, be fined in a sum of not more than five hundred dollars or be imprisoned for a period of not more than ninety days, or shall suffer both fine and imprisonment, in the discretion of the court.

SEC. 2. That the President of the United States is hereby authorized, in his discretion, to declare by public proclamation historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest that are situated upon the lands owned or controlled by the Government of the United States to be national monuments, and may reserve as a part thereof parcels of land, the limits of which in all cases shall be confined to the smallest area compatible with the proper care and management of the objects to be protected: *Provided*, That when such objects are situated upon a tract covered by a bona fide unperfected claim or held in private ownership, the tracts, or so much thereof as may be necessary for the proper care and management of the object, may be relinquished to the Government, and the Secretary of the Interior is hereby authorized to accept the relinquishment of such tracts in behalf of the Government of the United States.

SEC. 3. That permits for the examination of ruins, the excavation of archæological sites, and the gathering of objects of antiquity upon the lands under their respective jurisdictions may be granted by the Secretaries of the Interior, Agriculture, and War to institutions which they may deem properly qualified to conduct such examination, excavation, or gathering, subject to such rules and regulations as they may prescribe: *Provided*, That the examinations, excavations, and gatherings are undertaken for the benefit of reputable museums, universities, colleges, or other recognized scientific or educational institutions, with a view to increasing the knowledge of such objects, and that the gatherings shall be made for permanent preservation in public museums.

SEC. 4. That the Secretaries of the departments aforesaid shall make and publish from time to time uniform rules and regulations for the purpose of carrying out the provisions of this act.

Approved, June 8, 1906.

REPORT OF THE ACTING SUPERVISOR OF ROCKY MOUNTAIN NATIONAL PARK.

ROCKY MOUNTAIN NATIONAL PARK,
OFFICE OF SUPERVISOR,
Estes Park, Colo., October 4, 1915.

SIR: Pursuant to instructions of departmental letter of September 24, 1915, I make the following report on the affairs of the Rocky Mountain National Park.

GENERAL STATEMENT.

The Rocky Mountain National Park was created on January 26, 1915, on which date the act of Congress was approved. (Public, 238, 63d Cong.) This park is located in the northern part of Colorado and has an area of 358½ square miles, and includes the principal part of the Rocky Mountain Range, the highest point being Longs Peak, which is 14,255 feet, and 14 mountain peaks that are over 13,000 feet above sea level. The park is accessible to tourists and travelers at numerous points on the eastern and western boundaries, where trails have been in existence for a number of years.

There are two roads within the boundaries of the park which are accessible from the county roads without passing through private property before entering the park. The most central point from which the public can enter the park to different points therein is Estes Park, a small village located about 3 miles from the nearest point to the park boundary and approximately 7½ miles from the main entrance where the Fall River Road enters the park.

The nearest point from the main entrance to a railroad is 29½ miles. The supervisor's office for this park was opened July 10, 1915, and located at the village of Estes Park, the nearest points to railroad stations from that place being Lyons, Colo., 22 miles; Loveland, 33 miles; Fort Collins, Colo., 46 miles; and Boulder, 40 miles—automobile stage lines making regular trips between these points and Estes Park, with special rates during the tourist season. I assumed charge of the Rocky Mountain National Park as acting supervisor on July 1, 1915, and was unable to accomplish as much as I desired owing to the fact that I was unassisted, no appointments of employees being made until August 10, when one ranger was appointed. Consequently there has been little progress made this season toward improvements in the park.

ROADS.

Fall River Road.—The Fall River Road, which was constructed with State convict labor in 1914, before the national park was created, was built to a point about 2 miles within the park boundary.

Construction of this road is now being continued to a point 3 miles distant from where the convict work ended. This work is being done under contract by the State of Colorado at a cost of $18,000, $2,500 of which is to be paid by the Department of the Interior. The contractor commenced under the present contract, on July 2, 1915, and expects to complete the work by November 1 of this year. This road when completed will terminate at the junction of the county road, about 9 miles north of Grand Lake, a distance of approximately 19½ miles within the park boundary, and will reach the highest point when crossing the Continental Divide at about 11,300 feet above sea level.

That part of the Fall River Road which was built by convict labor is in fair condition but requires repairing at certain points. It is entirely too narrow, in some places being only 8 and 10 feet in width. The point known as the second "switchback," which is reached by a 12 per cent grade, was not sufficiently wide for the average vehicle to change direction without a "seesaw" movement, which made the point extremely dangerous, there being no protection to prevent a vehicle from going over the embankment.

This defect has been remedied by cutting into the bank a distance of 8 feet, thereby enabling a large automobile to make the turn. Contract has been let for the construction of a stone retaining wall at this point, and when completed all chances of accidents at this point will be eliminated. At the time of building the "convict road" no culverts were constructed, and this is necessary at points 400 feet apart where the grade is 7 per cent or more. These culverts should be installed as soon as possible in the spring of 1916, and the gutters opened up. The county road extending into the park on private holdings is in bad condition. A survey of the balance of the Fall River Road should be made before any further steps are taken to continue the construction. The survey which was made in 1912 was a preliminary survey only.

Road to Sprague's.—There is a roadway entering the park running parallel to Glacier Creek approximately 1½ miles in length which was constructed by Mr. A. E. Sprague at his own expense, and leads to his summer resort, located in the park. Access to this road is through private property. The road is in fair condition and an expenditure of $100 would improve it considerably.

Road to Bear Lake.—Continuing from Sprague's resort in a westerly direction and extending to within 1 mile of Bear Lake is a roadway, 2 miles in length, in poor condition. At an expenditure of about $300 this roadway could be made passable for automobiles, if a log bridge was constructed across Glacier Creek in close proximity to Sprague's resort.

Copeland Lake Road.—There is a roadway entering the park near Copeland Lake and extending a distance of approximately 1½ miles. The road is in poor condition and was built by the Arbuckle Supply & Reservoir Co., and is passible for horse-drawn vehicles only and leads to a trail to "Wild Basin."

Road to Mill Creek Ranger Station.—This road runs parallel to Mill Creek and extends about one-half mile into the park. The road is in poor condition, and in order to enter the park at this point it is necessary to pass through private lands over a road which is exceed-

ingly bad. Very few visitors enter the park at this point except with saddle horse. This road could be repaired within the park at small expense, but unless the road outside the park were put in proper condition there would be no object in expending any money on the road within the park at this point. Most of the traffic over this road is by local residents removing firewood which is obtained in the vicinity of the Mill Creek Ranger Cabin and known as the "Pole Patch."

Beaver Creek Road.—There is a roadway which starts from the "High Drive" in Horseshoe Park, outside the National Park, and crosses the National Park boundary line in sec. 19, T. 5 N., R. 74 W. and extends for a distance of approximately 1¼ miles. This roadway was built to remove timber some time in 1910 and is in fair condition, but would require considerable expense to put in proper shape for automobiles.

Grand Lake County Road.—A roadway extending approximately 1¾ miles within the park boundary, which is a part of the Grand Lake–Fall River Road, has just been completed under the supervision of the county commissioners of Grand County. The expense of the construction of this road was defrayed with State and county funds. The road runs through timber where a 40-foot right of way was cut. It is designated a 16-foot roadway but is considerably wider in numerous places. The grade is less than 1 per cent. It will eventually connect with the Fall River Road which is now under construction. The roadway at the present time ends in sec. 24, T. 4 N., R. 76 W. The work was performed by day labor. Corrugated iron culverts were used in the construction. There is considerable timber along the right of way which should be disposed of in the same manner as was done with the timber on the Fall River Road.

TRAILS.

Most of the interesting parts of the national park can be reached by trail only, which are in fairly good condition, and if the spring opens sufficiently early in 1916 they can be put in good condition for use of tourists during the summer season. There are approximately 128.5 miles of trails in the Rocky Mountain National Park, as follows:

Grand Lake Trail (via Flat Top Mountain).—The principal and most widely known trail within the national park is the one leading from Estes Park to Grand Lake. This trail enters the national park 6½ miles from Estes Park and crosses the western park boundary one-fourth mile from Grand Lake, 18¼ miles within the national park. This trail has been cleared of all timber, and with some repair work done above timberline will be considered a good trail.

Grand Lake Trail (via Milner Pass).—This trail leaves the Fall River Road 12½ miles from Estes Park, and crosses the western park boundary 12½ miles north of Grand Lake, where it joins the county road. Length of trail 11 miles.

Bierstadt Lake Trail.—Leaves Flat Top Trail near Mill Creek Ranger Station, follows old sawmill road full distance. Some of trail is in bad shape and in need of repair. Distance from ranger cabin to lake 1 mile.

Bierstadt Lake Trail (from Glacier Creek).—From Glacier Creek to Bierstadt Lake, starting at the junction of Storm Pass Trail. Distance 1½ miles. Built by the Forest Service in 1914. Trail in good condition.

Bear Lake Trail.—Joins the Flat Top Trail 1½ miles from Bear Lake. Trail in fair condition.

Bear Lake Trail.—From "Miners Cabin" to Bear Lake. Distance 1 mile. Trail in good condition.

Loch Vale Trail.—From "Miners Cabin" to Loch Vale, distance 3 miles. Trail needs repair. Built in 1913 by the Estes Park Improvement Association.

Storm Pass Trail.—Leads from Glacier Creek to Storm Pass, distance 4 miles. Built by the Forest Service in 1914. Trail in good condition. Trail to summit of Longs Peak. Trail enters national park 1 mile above Longs Peak Inn, and leads to the summit of Longs Peak, 14,255 feet high. Distance 6 miles, 2½ miles by foot trail only. Trail needs some repair from Mill Creek Ranger Station to "The Pool." Trail passes over "Steep Mountain" from the Ranger Station to the "Pool," a distance of 2½ miles. Trail in fair condition.

Trail to Fern, Odessa, and Helene Lakes.—From Moraine Park past Fern and Odessa Lakes, terminating at Helene Lake. Distance 6½ miles. A new trail from Fern Lake to Lake Odessa was constructed in the fall of 1914. This trail should be repaired and extended so as to join the Flat Top trail, passing Lake Helene and Two River Lake.

Lawn Lake trail.—Leads from Horseshoe Park to Lawn Lake. Distance 6 miles. Needs repair.

Ypsilon Lake trail.—Branches from the Lawn Lake trail one-half mile from Horseshoe Park and extends 4 miles to the lake. In good condition.

Crystal Lake trail.—From Lawn Lake to Crystal Lake. Distance about 1 mile. Trail poorly built and needs construction.

Tombstone Ridge trail.—From Moraine Park through "Windy Gulch" to Poudre Lakes. A scenic trail, but is in poor condition. Distance 15 miles.

Lost Lake trail.—Trail follows North Fork of Big Thompson River to Lost Lake. Distance about 9 miles from Park boundary line.

Specimen Mountain trail.—From Poudre Lakes to "The Crater," on Specimen Mountain. Trail poorly constructed. Needs considerable repair work. Distance 1½ miles.

Poudre River trail.—From Pingree Park to the South Fork of the Poudre River and then up the river to its source at Poudre Lakes. Distance about 15 miles. Little work, other than "blazing," has been done on this trail.

Sand Beach Lake trail.—From Copeland Lodge to Sand Beach Lake. Distance 6 miles. Trail in good condition.

Thunder Lake trail.—From Copeland Lake to Thunder Lake, in "Wild Basin." Distance 9 miles. Trail in fair condition.

Ouzel Lake trail.—From Copeland Lake to Ouzel Lake and Ouzel Falls. Distance 7 miles. Built by the Forest Service. In good condition.

LAKES.

Within the boundaries of the national park are over 100 lakes. The following is a list of the largest and most important, showing the approximate altitude and area of each. Those marked with an asterisk (*) have been stocked with fish.

Lakes in Rocky Mountain National Park.

Lake.	Area, in acres.	Altitude, in feet.	Lake.	Areas, in acres.	Altitude, in feet.
Arrow Head	30	11,000	Nanita	50	10,770
*Bear	11	9,542	*Odessa	17	10,055
Bierstadt	13	9,385	Ouzel	12	9,930
Black	4	10,690	Sand Beach	55	10,150
Blue	3	11,340	Thunder	15	10,570
Chasm	6	11,943	*Two River	8	10,650
*Crystal	7	11,470	Ursulla	7	9,980
Cub	6	8,680	Verna	20	10,150
*Fern	13	9,550	*Ypsilon	15	10,572
Gibralter	20	11,000	Poudre Lakes	10	10,750
Four Gorge Lakes	10-20	11,500	Forest	15	10,500
Husted	7	.....	Loch Vale	20	10,240
*Lawn	65	10,950	Rainbow	18	11,770
*Lost	25	.....	Hour Glass	8	11,230
Louise	6	.....	Spruce	10	9,700
Mills	10	10,000	Tourmaline	6	10,500
Nakoni	15	11,100	Helene	4	10,650

MOUNTAINS.

The Rocky Mountain National Park is composed of an area of mountain peaks, 43 peaks being over 10,000 feet above sea level, the highest point being Longs Peak, which reaches an altitude of 14,255. There are 14 peaks over 13,000, 17 over 12,000, and 7 over 11,000. The following is a list of peaks and their altitudes:

Mountains in Rocky Mountain National Park.

	Feet.		Feet.
Longs Peak	14,255	Andrews Peak	12,564
Mount Meeker	13,911	Mount Dunraven	12,548
Chiefs Head	13,579	Specimen Mountain	12,482
Hagues Peak	13,554	Mount Chapin	12,458
Mount Fairchild	13,502	Tanima Peak	12,417
Mount Ypsilon	13,500	Flat Top Mountain	12,364
Pagoda Mount	13,491	Snow Drift Peak	12,280
Mummy Mount	13,413	Nakai Peak	12,221
Storm Peak	13,335	Mount Adams	12,215
Mount Alice	13,310	Mount Craig	12,005
Lady Washington	13,267	Battle Mountain	11,930
McHenry Mount	13,200	Mount Dickinson	11,874
Mount Copeland	13,176	Meadow Mountain	11,634
Taylor Peak	13,150	Bighorn Mountain	11,473
Mount Chiquita	13,052	Mount Patterson	11,823
Mount Julian	12,928	Mount Tileston	11,244
Stones Peak	12,915	Estes Cone	11,017
Hallett Mountain	12,715	Nisa Mountain	10,791
Terra Toma Peak	12,686	Lookout Mountain	10,744
Mahona Peak	12,629	Mount Enentah	10,737
Thatchtop	12,600	McGregor Mountain	10,482
Mount Ida	12,600		

GLACIERS.

Halletts Glacier.—Altitude 13,000 feet. Distance from Estes Park 17 miles—7½ by roadway, 6½ by horse trail, then 3 miles by foot.

Sprague's Glacier.—Altitude 12,000 feet. Distance 3½ miles from Fern Lake—14½ miles from Estes Park.

Tyndall Glacier.—Altitude 12,000 feet. Located at summit of divide. Can be reached with saddle horse over Flat Top trail—13 miles from Estes Park.

Andrews Glacier.—Altitude 11,750 feet. Located 2 miles from Loch Vale. Trail to Loch Vale only. Distance from Estes Park 15 miles.

Taylor Glacier.—Altitude 12,500 feet. Distance from Loch Vale 2½ miles. Trail to Loch Vale only—15½ miles from Estes Park.

FISH.

It has been the custom of the State game and fish commissioner to stock certain lakes and streams in this locality with trout, and this has been continued since the national park has been created. Since January, 1915, 165,000 trout have been placed as follows:

Head waters of the Big Thompson River (Brook trout)	25,000
Head waters of the Big Thompson River (Rainbow)	30,000
South Fork of the Thompson River (Rainbow)	30,000
South Fork of the Thompson River (Brook trout)	20,000
Upper Fall River (Rainbow)	30,000
Lower Crystal Lake (Rainbow)	10,000
Two River Lake (Rainbow)	5,000
Odessa Lake (Rainbow)	5,000
Fern Lake (Rainbow)	10,000
Total	165,000

There are two fish preserves in the park stocked by private parties, one by A. E. Sprague, consisting of two lakes covering an area of 20 acres, stocked with Eastern Brook, and Arrowhead Lake sometimes known as Heinricy Lake, which was stocked in 1914 with 30,000 "Native trout."

ANIMAL LIFE.

Deer.—Owing to the protection under the game law of the State deer have been increasing rapidly, there being about 600 in the park and surrounding the boundary. They are rarely seen on account of the heavily timbered country.

Elk.—In 1912, 20 head of elk were shipped from Wyoming and put into the forest, a part of which is now the national park. In 1913, 25 more were shipped from the same place. A portion of these animals died, and at present there are approximately 30 elk in the national park and vicinity.

Bear.—There are only a few bear in the park, and these are specimens of the common black bear.

Sheep.—The Big Horn sheep are found in considerable numbers, and some of them are exceptionally tame, tourists having approached within a few yards of them. From what information I have been

able to obtain the increase for the last year has been exceptionally large.

Wild birds and fowls.—Game birds are scarce within the park. The ptarmigan may be found in small numbers on the range above timber line. Owing to the open season on grouse in the State of Colorado, they have become nearly extinct in this locality, but under the protection afforded by the park rules these birds will increase rapidly.

Fur-bearing animals.—To a person wishing to see beaver at work an exceptional opportunity is afforded to visitors, owing to the fact that the beaver are plentiful in various localities in the park. Other fur-bearing animals are few, owing to the fact that they have been trapped in past years prior to the establishment of the national park.

Predatory animals.—There are coyotes and mountain lions roaming within the park, and if they increase to any extent will become a detriment to the preservation of other animals, when action will be necessary looking toward their destruction.

FOREST FIRES.

Owing to the fact that there has been a great deal of rain during the summer very few fires have occurred. Several fires were caused by careless campers, but were extinguished by passers-by.

There are six tool boxes located in different parts of the park which will be supplied with the necessary paraphernalia for fighting forest fires, in addition to installing tools in the ranger cabins.

RANGERS.

There are only three rangers provided for this park, at a salary of $900 per annum, which salary I do not consider sufficient to attract the right kind of men for this class of labor. This is an expensive locality to live in, and by the time a ranger has subsisted himself and his horse he has little left for his efforts. In my opinion the salaries should be increased to $1,200 per annum. A chief ranger is not required for this park until the number of rangers has been increased to five or more.

RANGER STATIONS.

There are four ranger cabins within the park and located as follows:

Mill Creek Ranger Station.—Located on Mill Creek, one-half mile from boundary line and about 7 miles from Estes Park village. Partly furnished. Connected with telephone.

Fall River Ranger Cabin.—Located on the Fall River Road, 5 miles from park boundary line and about 14½ miles from Estes Park village, about one-half mile from terminus of present contract of Fall River Road. Partly furnished.

Shelter cabin, Flat Top trail.—Located on Flat Top trail, 11 miles from Grand Lake and 15 miles from Estes Park. Not furnished.

Specimen Ranger Cabin.—Located at Poudre Lakes. Located about 3 miles from the western boundary and 10 miles from eastern boundary line by trail; 19½ miles from Estes Park village. Not furnished.

FIREWOOD.

Free firewood permits are issued to residents of Estes Park and vicinity for their own use, with the understanding that they are to volunteer their services when necessary to suppress forest fires. These permits are issued for "dead and down" timber located in the "pole patch" near Mill Creek Ranger Station.

Permits are issued for firewood for "commercial purposes" at the rate of 50 cents per cord. This wood is also taken from the "pole patch."

There is sufficient "fire killed" and "dead and down" timber located in the "pole patch" to supply the residents of Estes Park and vicinity for a number of years.

Ten "free permits" for firewood have been issued this season for 74 cords, and one permit for 200 cords for "commercial purposes" to the Y. M. C. A. conference of Estes Park.

PERMITS.

The following permits have been issued:

Shepard N. Husted, permit to guide, $25 per annum.
Charles E. Hewes, permit to guide, $25 per annum.
Glenn E. Mills, permit to guide, $25 per annum.
Clifford S. Higby, permit to guide, $25 per annum.
A. E. Sprague, permit for 3,000 feet logs, unscaled.
W. R. Kibbe, permit for 3,000 feet logs, unscaled.
D. J. March, all cut timber on Fall River Road, $80.
Y. M. C. A. conference, 200 cords firewood, $100.

CONCESSIONS.

No concessions have been granted other than the continuation of the permits for hotels and resorts issued by the Forest Service prior to the creation of the park.

There are six resorts within the park boundary, as follows:

Concessions in Rocky Mountain National Park.

HOTELS AND CAMPS.

	Rate for period stated.
Higby Bros., summer hotel and resort at Fern Lake, permit expires Dec. 31, 1915	$15
Higby Bros., summer hotel and camp at The Pool, permit expires Dec. 31, 1915	10
A. E. Sprague, summer hotel building and fish preserve at Bartholdt Park, permit expires Dec. 31, 1915	35
Willard H. Ashton, summer camping grounds at Lawn Lake, permit expires Dec. 31, 1915	15
Enos Mills, shelter cabin at timber line, Longs Peak, permit expires Dec. 31, 1915	10
E. A. Brown, summer camping grounds at Bear Lake, permit expires Dec. 31, 1915	15

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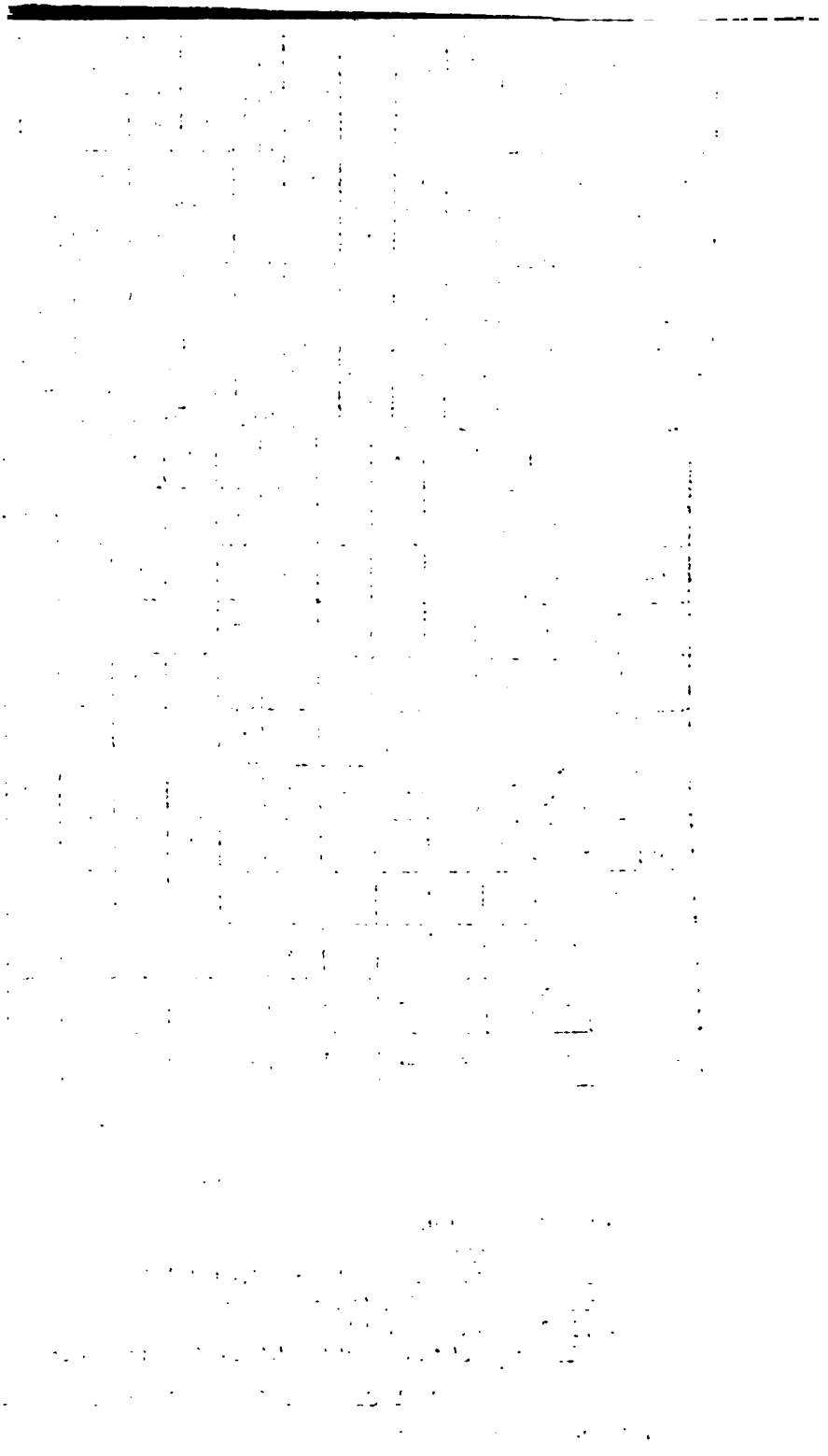

OTHER PERMITS.

	Rate for period stated.
Willard H. Ashton, use of 10 acres of land on Lawn Lake for pasture purposes	2
Willard H. Ashton, use of telephone connection to Government line. Permit transferred to Bradley & Patrick, proprietors of Horseshoe Inn, which they purchased from Mr. Ashton	
Charles E. Hewes, authorizes construction of a trail in park, and use of 3 acres of land on which to maintain summer hotel	
J. H. Hutchinson, authorizes construction of a wagon road approximately 7 miles long from park line to Hutchinson Lakes. No charge is made for the privilage other than the road is to be open to the Government free of charge	

In my opinion the rates heretofore made by the Forest Service for permits for resorts were entirely too small.

RESERVOIRS.

There are a number of irrigating ditches and reservoirs located in the park title to which is in the name of private parties and corporations. This matter will be investigated at first opportunity and report made thereon.

CATTLE.

There have been no permits issued to transport stock through the park, and only one instance is known where stock was transported and the owner of said stock has been notified by me of the rules and regulations covering this matter. There is no stock grazing in the park at the present time under permit, and the department has decided not to allow the use of lands within the park for grazing purposes.

MINERAL CLAIMS.

There are several so-called "mineral claims" within the park, and this matter is now under investigation to find whether or not the claims are valid.

PATENTED LANDS.

There are 16 locations of patented lands, homestead entries, timber and stone, and pre-emption entries within the park. One of these locations is that of Daniel T. March, in sec. 11, T. 5 N., R. 74 W., which is just within the boundary line on the Fall River Road at what is now known as the main entrance to the park.

TELEPHONE LINES.

There are at the present time within the park boundaries two telephone lines, one being located parallel with Mill Creek, which was used to connect the Mill Creek ranger station with the public telephone line. The line extends approximately one-half mile within the boundary and 3½ miles outside. The line is in good condition, with the exception of three-fourths mile, which requires reconstruction. It is the intention to install a telephone instrument in the Mill Creek ranger station this fall.

The Fall River line extends from the public exchange in Estes Park, running parallel with the Fall River Road to the main entrance of the park, and has been extended by the contractor of the Fall River Road for a distance of 1½ miles. I believe it will be advisable to install a telephone instrument at this point and continue the line to Fall River ranger station, a distance of 3½ miles, and eventually to continue the line to Specimen ranger station, a distance of 5 miles from the Fall River station.

TRANSPORTATION.

There is no transportation furnished this office, and it has been necessary to hire an automobile on numerous occasions to make trips to certain points of the park which are accessible. Had there been available transportation, no doubt, more frequent trips would have been made, and it might be advisable to consider the purchase of an automobile to be used in connection with the administration of this office.

CASUALTIES.

During the month of August Bertha Herbaugh, of Highland, Ill., dislocated her elbow on the trail to Fern Lake. Proper action was taken at the time, consequently the affair was not serious.

On September 2, 1915, Dr. Thornton R. Sampson, of Austin, Tex., left Grand Lake with the intention of going to Estes Park, and was last seen by a licensed guide on the Flat Top trail about 2 miles from Grand Lake. On notification of his disappearance September 14, prompt action was taken to locate his whereabouts, and volunteer searching parties were organized, assisted by Forest Service rangers and park rangers, but without result. The supposition is he became bewildered after reaching Flat Top Mountain and was unable to locate the trail. It is also possible that Dr. Sampson may have been struck by lightning or may have had an attack of heart failure.

Since the disappearance of Dr. Sampson, the line of cairns which distinguish the trail across Flat Top Mountain have been rearranged, and numerous other cairns which were in existence have been destroyed. The cairns at the present time are arranged about 200 feet apart, and it is the intention to paint them white, with a black circle about 1 foot from the top.

VISITORS.

It is impossible to report the number of persons who visited this park during the season of 1915 other than a rough estimate. The majority of people entering the park enter through the eastern boundary, as a rule, from the village of Estes Park. During the summer season of 1914 a check was kept of the number of visitors to this region, and an estimate of 56,000 persons was made at that time. From observation and information obtained from business men in this locality, I would state that the number of visitors to Estes Park during this season was 10,000 less than the previous year, viz, 46,000. Estimating that two-thirds of this number entered the National Park, this would make the approximate number of visitors 31,000.

The following list shows the number of patrons of the resorts within the park during the past season:

Higby Bros., Fern Lake, hotel and summer camp	1,055
Higby Bros., The Pool, rest house (estimated)	25
Willard H. Ashton, Lawn Lake, rest house (estimated)	100
Enos Mills, Longs Peak, shelter cabin, lodging and meals	430
Enos Mills, Longs Peak, shelter cabin, without lodging or meals	1,064
A. E. Sprague, Bartholdt Park, hotel and summer resort (estimated)	800
E. A. Brown, Bear Lake, summer resort and camp (estimated)	500

RECOMMENDATIONS.

I herewith submit the following recommendations: That this office should have the services of a clerk and stenographer at a salary of $900 per annum; that a two-seated automobile be purchased for the use of this office; that the salaries of rangers be increased to $1,200 per annum; that the force of rangers be increased to four for the present; that legislation be recommended for an appropriation of $50,000 for the continuation of the Fall River Road; that the telephone line on Fall River Road be extended to Specimen ranger station; that a shelter station be constructed on the eastern slope of Flat Top Mountain.

Also that the following new trails be constructed, if an appropriation is made sufficiently large for this purpose, the average cost of trails in this locality being approximately $150 per mile: Trail on Tombstone Ridge, terminating at Poudre Lakes, distance 15 miles; trail from Lake Helene to Flat Top Mountain, distance 1½ miles; trail from Odessa Lake to Lake Helene, distance 1¼ miles; trail from Fern Lake to Hour Glass Lake via Spruce Lake, distance 3 miles; a trail from "The Pool" through Forest Canyon to Poudre Lakes, distance 15 miles, which trail would pass through the best-timbered region in the national park; a trail to Mills Lake and Glacier Gorge, distance about 3 miles; a trail from Fall River ranger cabin to the northern boundary of the park at a point where the Poudre River crosses the boundary line, distance about 5 miles; foot trail to Chasm Lake, located at the head of "East Gorge" of Longs Peak.

Very respectfully,

C. R. TROWBRIDGE,
Acting Supervisor.

The SECRETARY OF THE INTERIOR,
Washington, D. C.

APPENDIX.

RULES AND REGULATIONS APPROVED MAY 29, 1915.

National parks are established for the benefit and enjoyment of the people, preserving the natural conditions within their boundaries in unimpaired form for present and future generations. In furtherance of this, the Secretary of the Interior asks the cooperation of the public in the following rules and regulations:

(1) Cooperation is sought toward preventing the destruction, injury, or defacement in any way of the public property or the trees, vegetation, rocks, minerals, animal and bird, or other life, or other natural conditions and curiosities in the park.

(2) Visitors and others must not cut living timber without written permission of the supervisor. Camping parties may use dead or fallen timber for fuel. Stumps should be cut as close to the ground as possible.

(3) It is very dangerous to life to throw stones from cliffs, to roll bowlders down hills, or to pollute the waters within the park, and such practices should be carefully avoided.

(4) Fires constitute one of the greatest perils to the park; they must not be kindled near trees, dead wood, moss, dry leaves, or other vegetable refuse, but in some open space on rocks or dirt. When fires are no longer necessary they must be completely extinguished, and the embers and bed smothered with dirt or water, so that there remains no possibility of reignition.

(5) The park is a sanctuary for wild life of every sort, and no one should frighten, hunt or kill, wound or capture any bird or wild animal in the park except dangerous animals when it is necessary to prevent them from destroying life or inflicting injury.

(6) The outfits, including guns, traps, teams, horses, or means of transportation used by persons engaged in hunting, killing, trapping, ensnaring, or capturing such birds or wild animals, or in possession of game killed on the park lands under other circumstances than prescribed above, must be taken up by the supervisor and held subject to the order of the Secretary of the Interior, except in cases where it is shown by satisfactory evidence that the outfit is not the property of the person or persons violating this regulation and the actual owner was not a party to such violation. Firearms will be permitted in the park only on written permission of the supervisor. Visitors entering or traveling through the park to places beyond should, at entrance, report and surrender all firearms, traps, nets, seines, or explosives in their possession to the first park officer, and, in proper cases, may obtain his written leave to carry them through the park sealed.

(7) Fishing is permitted with hook and line only and never for profit or merchandise. Fishing in particular water or except in special seasons may be suspended by the supervisor. All fish hooked less than 7 inches long shall be carefully handled with moist hands and returned at once to the water if not seriously injured. Fish retained should be killed. Thirty fish will constitute the limit for a day's catch.

(8) Much of the park area is little traveled, rugged, and, to inexperienced persons, dangerous, and visitors are urged to employ licensed guides. Large camp outfits and pack trains should be accompanied by a licensed guide, unless authority to travel without such licensed guide is granted by the supervisor. The supervisor will grant authority to competent persons to act as guides, and may revoke the same in his discretion.

(9) No person will be permitted to reside permanently, engage in any business, or erect buildings upon the Government lands in the park without permission, in writing, from the Secretary of the Interior.

(10) Owners of patented lands within the park limits are entitled to the full use and enjoyment thereof; the boundaries of such lands, however, must be

determined, and marked and defined, so that they may be readily distinguished from the park lands. While no limitations or conditions are imposed upon the use of such private lands so long as such use does not interfere with or injure the park, private owners must provide against trespass by their stock or cattle, or otherwise, upon the park lands, and all trespasses committed will be punished to the full extent of the law. Stock may be taken over the park lands to patented private lands with the written permission and under the supervision of the supervisor, but such permission and supervision are not required when access to such private lands is had wholly over roads or lands not owned or controlled by the United States.

(11) Allowing the running at large, herding, or grazing of cattle or stock of any kind on the Government lands in the park, as well as the driving of such stock or cattle over same, must be avoided except where authority therefor has been granted by the supervisor. The supervisor will make every effort not to burden bona fide settlers near the park boundaries in the grazing of their domestic stock, and has authority to deal with these and other special cases. Cattle or stock found improperly on the park lands may be impounded and held until claimed by the owner and the trespass adjusted.

(12) No drinking saloon or barroom will be permitted upon Government lands in the park, and, in conformity to the laws of the State of Colorado, the sale or gift of intoxicating beverages will not be permitted in the park after January 1, 1916.

(13) Only such private notices or advertisements as are necessary to the convenience and guidance of the public, and then only when arranged in appropriate style, will be allowed in the park.

(14) Campers and those stopping for lunch are urged to leave as little permanent evidence of their visit as possible. Camp should be pitched away from streams and highways. All paper, boxes, straw, and other inflammable litter or garbage should be carefully burned before leaving, and other refuse, such as cans, should be crushed and buried. Leave no refuse in or near running water.

(15) Automobiles are permitted on all the highways of the park without charge until further order, but reasonable speed, great caution, and frequent sound warning are essential to safety.

(16) Persons who render themselves obnoxious by improper conduct or who violate the letter or spirit of these regulations will be summarily removed from the park and not permitted to return without written permission from the Secretary of the Interior. No lessee or licensee shall retain in his employment any person whose presence in the park may be deemed by the supervisor subversive of good order and management of the park.

(17) The foregoing are hereby announced as the rules and regulations for the government of this park. The supervisor is hereby authorized and directed to remove all trespassers from the park lands and to enforce these rules and regulations and the provisions of Congress.

AN ACT TO ESTABLISH THE ROCKY MOUNTAIN NATIONAL PARK IN THE STATE OF COLORADO, AND FOR OTHER PURPOSES.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the tract of land in the State of Colorado particularly described by and included within metes and bounds as follows, to wit: Beginning at the southeast corner of section thirty-four, township three north, range seventy-three west of the sixth principal meridian, Colorado, thence north along the section lines to the northeast corner of section three, said township; thence west to the northwest corner of said section; thence north along the section lines to the northeast corner of section sixteen, township four north, range seventy-three west; thence west to the northwest corner of said section; thence north to the northeast corner of section eight, said township; thence west along the section lines to the northwest corner of section seven, said township; thence north to the northeast corner of township four north, range seventy-four west; thence west along the first correction line north, to the southeast corner of section thirty-six, township five north, range seventy-four west; thence north along the range line to the northeast corner of the southeast quarter of the southeast quarter of section thirteen, said township; thence west to the northwest corner of the southeast quarter

REPORT OF THE SUPERINTENDENT OF THE HOT SPRINGS RESERVATION.

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DEPARTMENT OF THE INTERIOR,
HOT SPRINGS RESERVATION,
OFFICE OF THE SUPERINTENDENT,
Hot Springs, Ark., August 13, 1915.

SIR: I have the honor to respectfully submit my annual report as Superintendent of the Hot Springs Reservation for the fiscal year ended June 30, 1915.

HISTORY.

While there is no positive historical data fixing the date of discovery of these hot springs, it is presumed from legendary traditions handed down that they were discovered by the nomadic primitive races and their healing waters were used for many generations before the adventurous Ponce de Leon set foot upon the Western Hemisphere. From the most reliable historical data available it is believed that these now famous Hot Springs were visited in 1541 by De Soto and his proud, chivalric band of Castilians, who were the first white men to drink from the "Fountain."

As nearly as can be established from truthful history the first white settlers came in the year 1800. Dunbar and Hunter of the Lewis and Clark Expedition visited the Hot Springs in 1804, and their report shows that they found an open log cabin and a few huts built of split boards, which had been erected by persons resorting to the springs for the restoration of their health. A cabin was built there by Manuel Prudhomme in 1807, and he was joined in the same year by John Purciful and Isaac Cates, who camped here and engaged in hunting and trapping.

From this time the fame of the springs began to spread and each year added to their patronage. Toward the end of the twenties there were permanent settlers at the springs. In 1832 four sections of land were reserved by the Government, with the hot springs near the center, and in 1878 this land was platted and sold to various claimants with the exception of that which now comprises the permanent Hot Springs Reservation and all of the hot springs. At the time of this subdivision the Government retained a large number of city residence lots, practically all of which have since been sold from time to time at public auction by order of the Secretary of the Interior, after due advertisement. None of these lots, however, were within the bounds of the permanent reservation, but located in the city proper.

The Hot Springs Reservation now contains an area of 911 acres, consisting of five units, viz, Hot Springs, North, West, and Sugar Loaf Mountains, and Whittington Lake Reserve Park, but the hot

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water springs issue forth only from the west slope and at the base of Hot Springs Mountain, which embraces 264 acres, and the 46 springs, with an average daily flow of 826,000 gallons and an average temperature of 135° F., are confined within an area of 500 by 1,400 feet.

Situated, as it is, in a spur of the Ozark Mountains, which are noted for their beauty, the natural scenic conditions are all that heart could wish, and to sufferers of various diseases it offers thermal radioactive water and climatic conditions unequaled, and no mineral waters yet discovered can show as great a number of cures or such a range and variety of ailments which the human body is heir to that yield to their almost miraculous influence.

The wisdom of the retention, control, and supervision of these springs under the fostering care of the National Government has been fully demonstrated during the years which have elapsed since its title was established. The trust reposed in the Government by the people has been guarded with extreme care. The springs are now the property of the people, free from monopoly and extortion, and within the reach of all. The obligation assumed carried with it responsibilities which have been discharged in a manner befitting their protection and benefit, and is a guaranty that in future years this priceless boon to suffering humanity will be administered with characteristic fidelity to the end that it may remain the common heritage of all mankind.

ADMINISTRATION.

Upon assuming charge of the reservation as superintendent August 4, 1914, I was fortunate in finding a corps of efficient employees who have been of great assistance in the proper administration of the affairs of this office.

The problems with which we have to contend are entirely different from those encountered in any of the other national parks, by reason of the fact that a large portion of the 125,000 or more visitors annually call at the superintendent's office for information and advice relative to doctors, bathhouses, hotels, etc. This information given is necessarily general in character, and in most cases a circular of general information issued by the department and a list of the registered physicians is furnished to the applicant. A large number of these persons are sick, debilitated, or nervous, and extreme care is taken to see that all receive kind and courteous treatment, which is highly appreciated by the visiting public. The visitor is the principal asset in Hot Springs, and should be treated with due consideration and made to feel at home upon his arrival.

Economy is practiced in the expenditure of funds, and practically all improvement work is done by day labor under direct supervision from the superintendent's office, thereby saving the profits that would otherwise go to contractors and giving the Government full value received for every dollar expended.

A complete daily report is rendered by the manager of each bathhouse, showing the name, home and local address, attendant, and doctor, if any, of each purchaser of a bath ticket, together with the total number of baths given each day, supplemented by a sworn monthly statement of the business of the bathhouse, and then at the end of each fiscal year a sworn annual statement is submitted by each bathhouse and the Arlington Hotel, showing the total receipts, itemized

expenditures, and net profits for the fiscal year just closed; all of the monthly and annual reports are carefully checked immediately upon receipt, and any discrepancies discovered are called to the attention of the lessee or manager and corrected at once. These reports, taken as a whole, furnish data for a complete, accurate, and comprehensive record of the business of the bathhouse.

OFFICIAL VISITORS.

During November, 1914, the Hot Springs Reservation was signally honored by a visit from the Hon. Bo Sweeney, Assistant Secretary of the Interior, accompanied by Mr. W. B. Acker, assistant attorney in the department, who for many years has been closely connected with the National Park Service. While here they had an opportunity of meeting, by appointment in the superintendent's office, a large delegation of the city's most prominent business and professional men, and after each citizen had expressed his views relative to the different matters pertaining to the best interest of Hot Springs and the Government reservation, the Assistant Secretary took up the different matters separately, which had been under discussion, and handled them in such an able and practicable manner that his remarks were the subject of much favorable comment by those present.

This visit was made at a most opportune time, during the week in which the Arkansas State Fair was held here, at which time there was a large attendance of people from all sections of the State, headed by Governor Hays and staff, together with nearly all other State officials, all of whom were delighted with the interest the department was taking in this resort.

A few days later in the month, on Thanksgiving Day, we were honored by a visit from the general superintendent and landscape engineer of national parks, Mr. Mark Daniels, whose eminent reputation in his chosen profession had preceded him. It is to be regretted that during his two days' stay it rained almost continually, thereby preventing him from viewing the reservation under favorable conditions. However, he expressed himself as highly pleased and prophesied a great future for this resort. I do not think there is a more advantageous place in this country for a landscape engineer to display his genius, nor one where his accomplishments would be enjoyed to a fuller extent by a greater number of America's health-pleasure seekers than on the Hot Springs Mountain from which flow the far-famed hot waters of mysterious healing.

Also, in the latter part of September of the same year, the reservation was visited by Mr. T. Warren Allen, chief of the Division of National Park and Forest Roads of the Department of Agriculture, who made a tour and thorough inspection of the system of mountain roads on the reservation, and took occasion to express himself favorably on their general condition.

For the Fourth of July celebration this year, Hot Springs had the distinguished honor of a visit from the Vice President of the United States, Mr. Marshall, who was accompanied by his wife. His visit here was the cause of a large and patriotic gathering being held at the State Fair Grounds, where he delivered an address which was highly appreciated by the large crowd who had the opportunity to hear him.

Mr. Marshall took a deep interest in the Government's possessions at Hot Springs, visiting this office, the bathhouses, and the Army and Navy General Hospital.

These visits from Government officials are beneficial in many respects and bring about a better understanding as to physical conditions as they actually exist.

It is expected that Hon. Stephen T. Mather, assistant to the Secretary of the Interior, and in charge of national park affairs, will visit Hot Springs and the reservation during the fall of the present year, which will be of immense value to both the department and the reservation.

It is also earnestly hoped that Hon. Franklin K. Lane, Secretary of the Interior, will find it convenient to visit this place in the very near future, as I feel that this is the most valuable reservation owned by the Government because of the fact that it affords an opportunity for restoration of health of hundreds of thousands of its citizens who are afflicted with ailments in which these life-giving waters are indicated.

In all, it is estimated that approximately 115,000 persons visited Hot Springs during the past year.

DOCTOR DRUMMING.

The nefarious practice of drumming patients to doctors was started in Hot Springs some 40 years ago when visitors were forced to reach there by means of the old-fashioned wild western stage coach. The drummers in those days would ride out 10 miles or more on horseback and meet the stages coming in and solicit the passengers to the different hotels, and later to some doctor, who would split his fee with the drummer.

During the past 10 years the department has promulgated rules and regulations setting forth conditions under which registered physicians may prescribe the baths, which, if followed to the letter, would eliminate the practice of drumming; but this office has experienced much difficulty in getting evidence sufficiently strong in character, as viewed by the department, to justify the removal of any of the doctor's names from the registered list for some time past.

When evidence of drumming is taken by the superintendent against any doctor the same is submitted to the Federal registration board, which in turn reviews it and transmits it to the department, together with such recommendation as in their judgment the case may warrant. The Federal registration board is composed of three members appointed by the Secretary of the Interior.

Even though the desired results have not been attained with regard to drumming, the constant investigations being made by this office has deterred this practice to a great extent, and it is safe to say that conditions have been much improved during the past two years. Drumming as it now exists is usually consummated through a "confidence game"; that is to say, the visitor will be approached by some person shortly after his arrival at the boarding house, who secures the confidence of the visitor, perhaps by telling him that he had the same trouble himself when he came here. The strange visitor will almost invariably ask who his doctor is, and

usually employs him, thereby drumming himself. The proprietor of the boarding house is the person who receives the split from the doctor. However, vigilance by this office has reduced drumming to such an extent that it is now confined to a very few doctors.

THE OERTEL SYSTEM OF MOUNTAIN CLIMBING.

On the roads on North Mountain and Hot Springs Mountain courses have been laid out for a scientific system of mountain climbing known as the Oertel system of graduated exercise, the same that is used at Bad Nauheim, Germany. The courses are indicated by stone monuments, finished with apex tops and painted, 300 feet apart. These monuments have the number cut on the face of each stone on two sides and are set so the patient can easily see the number or distance he has walked either coming or going. There are four courses or roads marked in this way and the number on each monument is painted in the color used for the course on the map.

A map 8 by 10½ inches has been prepared and may be procured by physicians at a nominal cost. Each course is represented in colors, yellow being used for a course comparatively level; green, for a course slightly inclined; blue, for a course moderately steep; and red for a course very steep. This map has a space on the back for the physician's directions and signature, so that the physician can prescribe in an accurate manner the distance and course required, according to the condition of the patient.

Course No. 1, slightly inclined and shown in yellow on the map, starts at the corner of Fountain Street and Central Avenue and extends up Happy Hollow (Fountain Street) to monument 18 intersecting course No. 3, at North and Hot Springs Mountain divide.

Course No. 2, shown in green on the map, starts at monument 5 and Government monument No. 36 on south line of Fountain Street at entrance to Hot Springs Mountain road and extends to monument No. 30, terminating at the drinking pavilion and tower at the top of the mountain where it joins course No. 3.

Course No. 3, shown in blue on the map, begins at junction of Canon Street and Central Avenue and extends to monument No. 33 at the pavilion and tower at the end of course No. 2. It traverses parts of North and Hot Springs Mountain roads.

Course No. 4, shown in red on the map, begins at the main entrance between Maurice and Fordyce bathhouses and extends up mountain walks to monument No. 8 on Hot Springs Mountain road, intersecting course No. 2. This is the steepest course.

This system of exercise is applicable to patients whose heart action is impeded by deposits of fat and is effective in preventing fatty infiltration from becoming localized in the heart. It is, first of all, a preventive measure and can be employed with advantage to improve the general nutrition of the heart. Even in cases where fatty deposits have occurred it is of great value, as it also is where the compensation has been already established by milder means.

In short, it may be said this system is beneficial to all incipient heart troubles, especially those of a myocardial nature.

Some of the other physiological phenomena noticed are the following: Acceleration of the heart rate; acceleration of breathing; elimination of an additional amount of carbon dioxide and increase of

intake of oxygen; increase of power of healthy heart muscle and muscles of respiration; increase of capillary circulation; increase of normal blood pressure in proportion to amount and degree of exercise.

So far known this is the only system of this kind in the United States. In connection with the baths it should be a great boon to patients suffering from such ailments as will be benefited by this method of treatment.

In making the survey and map for this system of exercise all of the roads and walks on Hot Springs, North and West Mountains, have been surveyed, measured, and accurately located on the map, which is of material benefit to all persons requiring reliable information as to distances, locations, etc.

GENERAL IMPROVEMENTS.

Among the more important improvements on the reservation during the past fiscal year are the following:

Completion of a reenforced concrete reservoir under the Fordyce Bathhouse, having a capacity of approximately 70,000 gallons, which is connected up with the main impounding reservoirs for the storage of the hot water on the reservation.

Completion of the installation of water service on top of Hot Springs Mountain, near the Hot Springs Mountain Observatory at a cost of approximately $1,040. This system consists of a pressed brick pump house, near the cooling tanks of the Army and Navy General Hospital, equipped with electric motor and pump, a line of 2-inch galvanized pipe, a 500-gallon cypress tank, and a drinking fountain and other connections in the drinking pavilion on top of Hot Springs Mountain.

Minor repairs at the Government free bathhouse, including a coat of pitch to the roof and repairs to the plastered walls in the building.

Removal of old iron light poles from the reservation front to points on Reserve Avenue between the Army and Navy Hospital and the superintendent's official residence, these poles having been supplanted by an up-to-date "white-way" lighting system on the reservation front.

The equipment of the tennis court at Whittington Lake Park and the fence were renewed and repaired.

Extensive and needed repairs to concrete walk on Bathhouse Row.

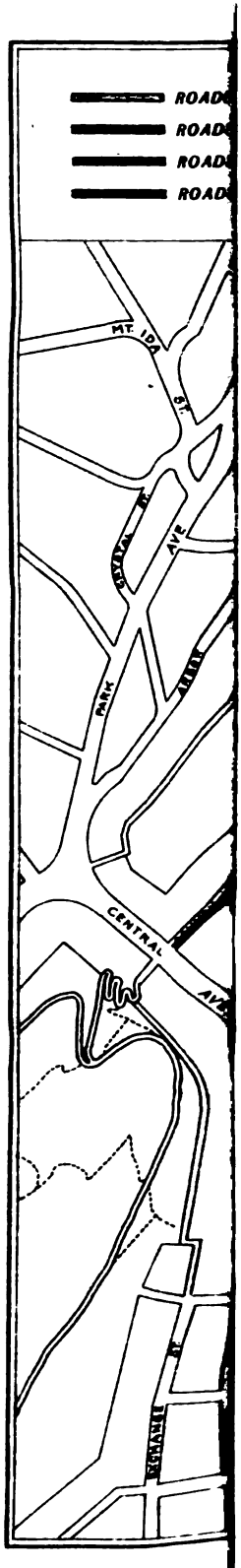
Burning of all underbrush and thorough cleaning of west slope of Hot Springs Mountain during the early spring.

Repainting and repairing floors and other portions of the interior of the superintendent's office.

Laying of approximately 200 linear feet of 18-inch drain tiling at Whittington Lake Park to better provide for surface drainage on that portion of the reservation.

Construction of 290 linear feet of rubble stone retaining wall, topped with Alabama limestone coping, on Reserve Avenue from Army and Navy Hospital grounds to grounds occupied by superintendent's official residence, this wall being 18 inches in thickness and averaging 3 feet in height.

Portion of work on new road, recently authorized by the department, leading from road on top of North Mountain to junction of Crag and Ramble Streets. This road affords an outlet from the system of mountain roads on Hot Springs and North Mountains to



ELEVATIONS ON HAPPY HOLLOW ROAD BEGIN
TRAL AVENUE AND FOUNTAIN STREET. CO
LEVEL (YELLOW).

Monuments.	Grade.	Elevation.
	Per cent.	*Feet.*
1	2.5	620.10
2	3.1	629.45
3	3.81	640.90
4	4.0	652.95
5[1]	3.43	663.25
6	3.93	675.05
7	5.21	690.70
8	5.58	707.45
9	8.52	733.02
10	9.89	762.70
11	7.78	786.05
12	7.52	808.63
13	6.58	828.39
14	7.29	850.28
15	7.08	871.53
16	6.71	891.68
17	6.41	910.93
18[2]	7.10	932.25

ELEVATIONS ON ROAD ON HOT SPRINGS MO
FOUNTAIN STREET TO TOWER. SLIGHT
(GREEN).

6	3.61	674.10
7	4.20	686.71
8	1.10	690.00
9	0.28	690.85
10	1.29	694.74
11	−0.11	694.39
12	−0.82	691.93
13	3.37	702.06
14	4.13	714.44
15	5.04	729.58
16	4.55	743.23
17	4.12	755.60
18	4.47	769.00
19	4.46	782.38
20	4.11	794.72
21	4.82	809.20
22	6.72	829.37
23	6.19	847.95
24	5.80	865.36
25	8.34	890.40
26	8.81	916.84
27	8.57	942.54
28	6.55	962.20
29	8.22	986.87
30	7.71	1,004.08

ELEVATIONS ON ROAD ON NORTH AND HOT S
TAINS FROM CENTRAL AVENUE AND CANYO
TOWER ON HOT SPRINGS MOUNTAIN. MODE
(BLUE).

1	10.43	651.31
2	13.33	691.31
3	9.80	720.73
4	5.52	737.31
5	6.60	757.12
6	8.99	784.09
7	9.88	813.73
8	11.06	846.90
9	13.16	886.38
10	7.85	909.95
11	8.00	933.95
12	4.04	946.07
13	6.97	967.00
14	11.46	1,001.37
15	− 1.51	996.83
16	− 2.93	987.03
17	2.28	993.86
18	5.94	1,011.68
19	− 1.85	1,006.12
20	− 8.66	980.13
21	−11.21	946.48
22	− 4.07	934.26
23	− 6.88	913.63
24	− 0.66	911.64
25	− 1.44	907.31
26	6.44	926.62
27	9.67	955.64
28	5.46	972.03
29	− 0.70	969.93
30	4.91	984.67
31	5.63	1,001.55
32	− 1.37	997.44
33	6.00	1,003.92

[1] Starting point of road on Hot Springs Mountain to Towe
[2] Junction of Happy Hollow Road and main road on Hot

[illegible], [illegible], [illegible] *in connection with map on other side.*

ıg unless marked —; grades marked — are descending.

ING AT CEN-
'ARATIVELY

Distance.
Feet.
300
600
900
1,200
1,500
1,800
2,100
2,400
2,700
3,000
3,300
3,600
3,900
4,200
4,500
4,800
5,100
5,400

NTAIN FROM
INCLINED

1,800
2,100
2,400
2,700
3,000
3,300
3,600
3,900
4,200
4,500
4,800
5,100
5,400
5,700
6,000
6,300
6,600
6,900
7,200
7,500
7,800
8,100
8,400
8,700
8,923

INGS MOUN-
STREET TO
TELY STEEP

300
600
900
1,200
1,500
1,800
2,100
2,400
2,700
3,000
3,300
3,600
3,900
4,200
4,500
4,800
5,100
5,400
5,700
6,000
6,300
6,600
6,900
7,200
7,500
7,800
8,100
8,400
8,700
9,000
9,300
9,600
9,708.50

ıfn.

ELEVATIONS ON PATH FROM CENTRAL AVENUE TO TOWER ROAD. VERY STEEP (RED).

1	12.87	644.91	300
2	14.67	688.93	600
3	22.40	756.13	900
4	12.78	794.49	1,200
5	19.27	852.30	1,500
6	15.17	897.80	1,800
7	14.13	940.18	2,100
8	6.32	959.15	2,400

PHYSICIAN'S DIRECTIONS.

----------, *19*----
(Date starting walk.)

the northern portion of the city of Hot Springs, by way of Ramble, Ravine, and Dell Streets; approximately 600 feet of this road were completed in June, 1915.

Construction of 6,645 cubic feet of retaining walls and 3,638 square feet of gutters along roads and in ravines on Hot Springs and West Mountains.

Distribution of 453 yards of gravel and 22 yards of soil on the mountain roads.

In addition to the above improvements completed, the department has recently authorized the paving with cement of the main entrance to the reservation leading off Central Avenue between the Fordyce and Maurice bathhouses, including sidewalks and gutters on both sides, the construction of two concrete foot bridges, walling up of ravines with rubble stone and cement, construction of retaining walls and concrete gutters and the installation of drain tiling on West Mountain, and the construction of approximately 6,000 feet of retaining wall and concrete gutters along the reservation side of the road leading through Happy Hollow, Fountain Street, to a point to be determined on Hot Springs Mountain, all of which work I expect to have completed early this fall.

EMPLOYEES.

There are at present 30 regular employees engaged in the administration, maintenance, protection, and care of the interests of the reservation. All of these employees were appointed from Arkansas under civil-service rules. A complete table showing the name, designation, and compensation of each employee follows:

Employees of the Hot Springs Reservation.

Name.	Designation.	Compensation per annum.
William P. Parks	Superintendent	$3,600
B. Frank Bayley	Chief clerk and assistant to superintendent	1,680
James W. Walker	Clerk-stenographer	1,200
J. H. Demby	Manager, free bathhouse	1,080
Richard L. Lawrence	Head male attendant, free bathhouse	840
Martin Winn (colored)	Male attendant	600
Van Cannon (colored)	....do	600
Elisha W. Baziel (colored)	....do	600
Wm. M. Dixon (colored)	....do	600
Mary Clark (colored)	Female attendant	480
Mattie Fielding (colored)	....do	480
Jonathan A. Jordan	Supervisor	1,320
Hiram N. Anderson	Policeman, detailed as train inspector	[1] 90
John W. St. Clair	....do	[1] 90
Richard L. Gaffney	Mounted policeman	960
Montgomery Prichard	Policeman	840
William H. Turner	....do	840
Peter Nelson	Laborer	720
Wm. F. Jennings	....do	720
Philander H. Bump	....do	720
Jap George	....do	720
Bishop H. Burrough	....do	720
Hiram Walters	....do	720
David W. Poda	....do	720
Patrick J. Dugan	Laborer, Whittington Lake Park	600
Robert L. Stutts	Laborer	600
Bruno Hoffmann	....do	600
Abraham Logan (colored)	Laborer, superintendent's office	600
James Daniels (colored)	Laborer, superintendent's residence	600
Oliver H. Hoskins (colored)	Laborer, reservation front and barn	600

[1] Per month.

REPORT OF THE SUPERINTENDENT OF THE HOT SPRINGS RESERVATION.

DEPARTMENT OF THE INTERIOR,
HOT SPRINGS RESERVATION,
OFFICE OF THE SUPERINTENDENT,
Hot Springs, Ark., August 13, 1915.

SIR: I have the honor to respectfully submit my annual report as Superintendent of the Hot Springs Reservation for the fiscal year ended June 30, 1915.

HISTORY.

While there is no positive historical data fixing the date of discovery of these hot springs, it is presumed from legendary traditions handed down that they were discovered by the nomadic primitive races and their healing waters were used for many generations before the adventurous Ponce de Leon set foot upon the Western Hemisphere. From the most reliable historical data available it is believed that these now famous Hot Springs were visited in 1541 by De Soto and his proud, chivalric band of Castilians, who were the first white men to drink from the "Fountain."

As nearly as can be established from truthful history the first white settlers came in the year 1800. Dunbar and Hunter of the Lewis and Clark Expedition visited the Hot Springs in 1804, and their report shows that they found an open log cabin and a few huts built of split boards, which had been erected by persons resorting to the springs for the restoration of their health. A cabin was built there by Manuel Prudhomme in 1807, and he was joined in the same year by John Purciful and Isaac Cates, who camped here and engaged in hunting and trapping.

From this time the fame of the springs began to spread and each year added to their patronage. Toward the end of the twenties there were permanent settlers at the springs. In 1832 four sections of land were reserved by the Government, with the hot springs near the center, and in 1878 this land was platted and sold to various claimants with the exception of that which now comprises the permanent Hot Springs Reservation and all of the hot springs. At the time of this subdivision the Government retained a large number of city residence lots, practically all of which have since been sold from time to time at public auction by order of the Secretary of the Interior, after due advertisement. None of these lots, however, were within the bounds of the permanent reservation, but located in the city proper.

The Hot Springs Reservation now contains an area of 911 acres, consisting of five units, viz, Hot Springs, North, West, and Sugar Loaf Mountains, and Whittington Lake Reserve Park, but the hot

it lacks many of the accessories which are enjoyed in the higher-priced houses.

The Arlington and Eastman bathhouses, which were reconstructed last year, have been kept up to the standard and run in keeping with the hotels with which they are connected.

The Imperial and Buckstaff bathhouses, which have been in operation for more than three years, have also been kept up to the standard and operated in such a manner as to give the public the best of services.

The Maurice bathhouse, which was opened in the same year as the two above mentioned, has submitted plans and specifications for extensive improvements, which, when completed, will cost approximately $15,000. These plans have been approved by the department and work has been commenced. This is a first class bathhouse, operated along the same lines as all the other bathhouses charging the same rate.

The Majestic and Moody bathhouses, the former having been rebuilt three years ago and the latter over a year ago, are both first class bathhouses, in good condition, well kept, and operated, in connection with their respective hotels, in a manner to give entire satisfaction to the public.

The Great Northern bathhouse was closed to the public May 15, 1915, this being the date on which the lease expired.

The Hot Springs bathhouse was closed to the public September 30, 1914, the lease having expired more than a year prior to that date. The property was later sold by the owners to the Arlington Hotel Co., and the expired lease has therefore not been renewed.

The Rector bathhouse was closed to the public June 30, 1915, plans having been submitted to and approved by the department last November for the remodeling of this bathhouse, but this being so near the beginning of the season the lessee was given verbal permission to continue through the season, which was done and the bathhouse closed on the above date in order that the same might be remodeled in accordance with the approved plans.

The St. Joseph's Infirmary bathhouse is comparatively speaking a new bathhouse, having been overhauled about a year ago, and is thoroughly equipped to cater to the first-class patronage which the infirmary enjoys.

The Rockafellow bathhouse, which is operated in connection with the Rockafellow Hotel, also enjoys a considerable patronage from adjacent hotels and boarding houses, and has been kept in good condition, having been repainted and renovated throughout just prior to January 1, 1915.

The Alhambra bathhouse, the lease of which expires February 29, 1916, is operated at a moderate price in order to cater to persons not desiring to pay more for baths. This bathhouse is a substantial brick structure, but it will probably be necessary at the expiration of the lease to make extensive repairs.

The Pythian sanitarium and bathhouse (colored) was completed and opened to the public December 27, 1914, although it was expected to open December 16, 1915. Water rent has been paid from that date, which was also the date of the lease. This is a good house. Considering the price charged, the administration of baths there will compare favorably with baths given in other low-priced houses.

The Ozark sanatorium bathhouse, while a small one, is entirely sanitary and operated in a manner satisfactory to its patrons. The

lessee had intended to erect a sanatorium in connection with the bathhouse, as was the case before the fire, but as yet has not fully completed his arrangements.

Three of the four remaining frame bathhouses on the reservation, the Ozark, Horseshoe, and Magnesia, the leases on which have long since expired, have been given until September 30, 1915, to prepare and submit plans for the construction of new and modern bathhouses on these sites. The fourth, the Lamar bathhouse, is the best of the frame houses and has until December 31, 1916, to continue on its present lease.

I am pleased to report that in the matter of the rebuilding of the Superior bathhouse, plans therefor are practically matured and a company is being formed for the purpose of building on the Superior bathhouse site a sanitary bathhouse, to cost not less than $50,000, to operate with a moderate rate for baths to cater to persons desiring baths at popular prices. It seems at this time that the rebuilding of this bathhouse is practically assured, as the plans have been approved except as to some minor details.

The Park bathhouse, which was destroyed by the fire of September 5, 1913, has not yet been rebuilt and the water rent thereon has been remitted until December 31, 1915.

Close supervision has been maintained over the bathhouses and attendants during the past year and frequent inspections have been the means of improving the service. The bathhouse managers are unaware of the times when these inspections are to be made, and in that manner can be seen just what service the bathhouses are giving from time to time and the degree of cleanliness maintained at all times. Advertising matter of all kinds whatsoever has been eliminated, and altogether it is believed an entirely satisfactory condition exists. All reports made by the bathhouses are full and complete and the records in this office are valuable, not only to the office but to persons desiring to locate friends whose address otherwise they are unable to obtain.

The following tables, showing the details and results of the operation of the bathhouses, have been compiled from the reports and other data on file in this office.

There are at present 18 bathhouses in operation in Hot Springs, with the following rates, approved by the Secretary of the Interior, in effect therein:

Rates at bathhouses.

Bathhouse.	Single bath.	Course of 21 baths.
Alhambra	$0.40	$7
Arlington	.55	10
Buckstaff	.55	10
Eastman	.55	10
Fordyce	.55	10
Hale	.40	7
Horseshoe	.35	6
Imperial	.45	8
Lamar	.40	7
Magnesia	.40	7
Majestic	.50	9
Maurice	.55	10
Moody	.45	8
Ozark	.35	6
Ozark Sanatorium	.40	7
Pythian (colored)	.25	4
Rector	.45	8
Rockafellow	.40	7
St. Joseph's Infirmary	.45	8

Half tickets for 10 baths are sold in all the bathhouses, and quarter tickets for 5 baths are sold in many of the bathhouses, at one-half and one-fourth, respectively, of the rates shown above. Also, in addition to the rates shown, there is a uniform attendants' fee, approved by the Secretary of the Interior, of 15 cents for a single bath, and $3 per course of 21 baths, which fee is collected by the bathhouse manager and by him accounted for to the attendant.

There are at the present time 26 leases of hot-water and ground privileges, and two have been discontinued, as shown in the following table:

Hot-water and ground leases.

Name of bathhouse, etc.	Lessee.	Tubs.	Date of lease.	Expiration.
Alhambra	Alhambra Bathhouse Co	18	Mar. 1, 1914	Feb. 29, 1916
Arlington [1]	Arlington Hotel Co	68	Mar. 21, 1914	Mar. 3, 1932
Buckstaff	Buckstaff Bathhouse Co	31	Jan. 1, 1912	Dec. 31, 1931
Eastman [1]	New York Hotel Co	64	May 13, 1912	May 12, 1932
Fordyce [2]	S. W. Fordyce	30	Jan. 1, 1915	Dec. 31, 1934
Great Northern [3]	Mrs. Fannie G. Williamson	17	May 15, 1912	May 15, 1915
Hale [4 5]	Emily M. Roots	25	Jan. 1, 1915	Dec. 31, 1934
Horse Shoe [6]	D. Fellows Platt	30	Jan. 1, 1895	Dec. 31, 1909
Hot Springs [7]	C. H. V. & G. M. Smith	16	Jan. 1, 1903	Dec. 31, 1912
Imperial	Chas. N. Rix	27	Jan. 1, 1912	Dec. 31, 1931
Lamar	M. C. Tombler and G. H. Buckstaff	30	Jan. 1, 1897	Dec. 31, 1916
Levi memorial [8]	Leo N. Levi Memorial Hospital Association.	5	Nov. 1, 1914	Oct. 31, 1924
Magnesia [9]	Chas. B. Platt	30	Jan. 1, 1895	Dec. 31, 1909
Majestic [1]	Avenue Hotel Co	23	Jan. 1, 1913	Dec. 31, 1932
Maurice	Maurice Bath Co	29	Jan. 1, 1912	Dec. 31, 1931
Moody [1]	Nicholas M. Moody	16	July 1, 1910	June 30, 1920
Ozark [6]	W. S. Sorrells and F. B. Latta	26	Jan. 1, 1904	Dec. 31, 1913
Ozark sanatorium	Ozark Sanatorium Co	10	Sept. 17, 1912	Sept. 16, 1922
Park [1 9]	Garland Hotel Co	47	May 13, 1912	May 12, 1932
Pythian [10]	Knights of Pythias (colored)	10	Dec. 16, 1914	Dec. 15, 1924
Rector [11]	Elias W. Rector	12	Apr. 16, 1904	Apr. 15, 1914
Rockafellow	Mahala J. Rockafellow	18	July 1, 1901	June 30, 1916
St. Joseph's Infirmary [1]	Sister Superior	10	Feb. 1, 1914	Jan. 31, 1924
Superior [12]	Robt. Proctor and R. A. Simpson	16	Sept. 15, 1896	Sept. 14, 1906
Waverly [13]	New Waverly Hotel Co	20	Mar. 24, 1893	Mar. 23, 1913
Horse Pool [9 14]	Simon Cooper	2	Oct. 18, 1912	Oct. 17, 1917
Arlington Hotel, ground lease.	Arlington Hotel Co	.....	Mar. 21, 1914	Mar. 4, 1932
Hot Springs Mountain Observatory, ground lease.	Hot Springs Mountain Observatory Co.	.....	Sept. 1, 1913	Sept. 1, 1928

[1] Water used in private bathrooms in portion of tubs leased.
[2] Completed and opened for business Mar. 1, 1915, replacing Palace bathhouse.
[3] Lease expired and bathhouse closed May 15, 1915.
[4] Remodeled and opened for business Jan. 1, 1915.
[5] Lease submitted but not yet executed.
[6] Tenants holding over.
[7] Lease discontinued and bathhouse closed Sept. 30, 1914.
[8] Completed and opened for business Nov. 1, 1914.
[9] Destroyed by fire Sept. 5, 1913.
[10] Completed and opened for business Dec. 16, 1914, replacing Crystal bathhouse.
[11] Closed for repairs June 30, 1915.
[12] Negotiations now pending for issuance of new lease to Superior Bathhouse Co.; bathhouse closed Mar. 31, 1911.
[13] Destroyed by fire Jan. 23, 1910.
[14] Water sufficient to supply 2 tubs.

Business of bathhouses for fiscal year ended June 30, 1915.

Bathhouse.	Whole tickets.	Half tickets.	Quarter tickets.	Single baths.	Baths sold.	Baths redeemed.	Net paid baths.	Complimentary baths.	Paid for redeemed baths.	Net bath receipts.	Receipts from massage and other sources.	Total receipts.	Total expenditures.	Net loss.	Net profit.
Alhambra	1,215	623	.....	1,569	34,064	3,964	30,100	84	$1,387.40	$10,188.20	$179.65	$10,367.85	$7,320.60	.....	$3,047.25
Arlington	1,091	1,309	150	2,837	38,838	5,268	33,570	79	2,699.00	16,316.35	2,400.00	18,716.35	10,776.33	.....	7,940.02
Buckstaff	1,513	1,135	779	2,654	49,672	5,179	44,493	402	2,589.50	21,622.70	1,708.65	23,331.35	20,127.96	.....	3,203.39
Eastman	121	509	.....	475	8,106	670	7,436	.....	367.55	3,648.70	325.00	3,973.70	4,100.00	$126.30	.....
Fordyce	594	448	268	815	19,109	2,264	16,845	92	1,232.20	8,156.05	1,027.75	9,183.80	4,580.83	.....	4,602.97
Great Northern	162	179	.....	1,693	6,885	973	5,912	.....	291.80	2,061.25	80.00	2,141.25	2,688.65	547.40	.....
Hale	955	975	.....	1,398	31,203	4,778	26,425	6	1,672.50	8,984.20	311.15	9,295.35	7,126.52	.....	2,168.83
Horseshoe	651	1,145	432	1,027	28,308	2,375	25,933	.....	712.50	7,635.95	164.15	7,800.10	5,756.70	.....	2,043.40
Hot Springs	70	72	.....	99	2,289	315	1,974	.....	126.00	766.55	448.75	1,215.30	920.97	.....	294.33
Imperial	1,019	625	239	793	29,637	3,919	25,718	208	1,923.30	12,561.25	486.50	13,047.75	10,097.37	.....	2,950.38
Lamar	975	1,133	586	1,341	36,076	3,633	32,443	84	1,349.80	11,847.80	366.35	12,214.15	7,246.12	.....	4,968.03
Magnesia	570	430	90	984	17,704	2,397	15,407	115	839.10	5,207.40	113.60	5,321.00	5,522.55	201.55	.....
Majestic	1,136	882	.....	1,075	33,751	5,680	28,071	32	2,448.80	12,281.70	300.00	12,581.70	8,977.93	.....	3,603.77
Maurice	1,827	1,122	686	1,665	54,682	5,541	49,141	84	2,770.50	23,740.25	1,978.35	25,718.60	20,492.08	.....	5,226.52
Moody	508	460	.....	702	15,970	1,836	14,134	.....	738.02	5,481.88	.....	5,481.88	3,238.00	.....	2,243.88
Ozark	2,010	1,619	713	2,939	64,904	8,879	56,025	392	2,664.95	16,350.20	82.75	16,432.95	7,609.80	.....	8,823.15
Ozark Sanatorium	368	347	.....	925	12,124	1,137	10,987	122	397.80	3,750.45	.....	3,750.45	3,011.81	.....	738.64
Pythian	147	190	29	322	5,454	262	5,192	.....	52.40	960.60	531.70	1,492.30	1,817.14	324.84	.....
Rector	218	169	54	232	6,552	934	5,618	112	373.75	2,258.65	.....	2,258.65	3,244.04	985.39	.....
Rockafellow	1,319	1,123	.....	1,376	40,305	3,982	36,323	.....	1,393.80	12,320.10	732.98	13,053.08	8,106.80	.....	4,946.28
St. Joseph's Infirmary	372	144	.....	174	9,426	946	8,480	.....	378.65	3,251.65	.....	3,251.65	2,116.00	.....	1,135.65
Total	16,841	14,639	4,026	25,095	545,059	64,932	480,227	1,812	26,309.32	189,391.88	11,237.33	200,629.21	144,878.20	2,185.48	57,936.49

Total receipts, less redemptions, of bathhouses, by months, for fiscal year ended June 30, 1915.

Bathhouse.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Total.
Alhambra	$1,258.85	$1,180.30	$624.75	$781.90	$706.00	$605.20	$904.95	$847.10	$973.20	$853.20	$916.75	$715.65	$10,367.85
Arlington	562.25	657.90	698.15	1,134.20	1,313.75	1,153.55	2,489.55	3,425.95	3,327.05	1,780.20	1,170.20	1,003.60	18,716.35
Buckstaff	2,374.90	2,505.75	1,738.35	1,352.90	1,706.15	1,461.05	2,067.10	3,087.00	2,468.00	1,900.65	1,513.80	1,155.70	23,331.35
Eastman							25.55	1,502.75	2,445.40				3,973.70
Fordyce									3,690.92	2,526.83	1,443.60	1,522.45	9,183.80
Great Northern	196.35	236.80	162.95	159.10	197.60	193.75	227.00	297.00	279.85	174.10	16.75		2,141.25
Hale							2,107.60	2,275.40	1,579.75	1,357.90	1,114.95	859.75	9,295.35
Horseshoe	857.50	976.20	638.30	602.80	710.05	680.45	730.40	561.75	591.90	486.45	590.45	373.85	7,800.10
Hot Springs	239.60	384.75	590.95										1,215.30
Imperial	1,302.35	1,363.45	1,062.50	632.80	879.10	797.55	1,549.05	1,769.65	1,283.20	1,104.30	522.55	781.25	13,047.75
Lamar	1,366.45	1,081.05	875.55	624.35	500.45	834.95	1,100.00	1,399.85	1,406.10	1,222.30	1,023.15	779.95	12,214.15
Magnesia	535.00	575.75	498.35	352.15	360.55	289.05	432.50	422.90	627.75	500.45	441.65	284.90	5,321.00
Majestic	948.30	1,060.00	561.15	543.75	658.55	618.85	1,310.00	2,107.95	2,174.45	988.45	978.60	631.65	12,581.70
Maurice	2,248.60	2,479.20	1,547.60	1,620.25	1,953.35	1,771.70	3,334.40	3,599.60	2,734.05	1,788.30	1,595.25	1,046.30	25,718.60
Moody	457.66	524.44	276.80	221.51	291.87	316.87	652.56	696.39	918.29	499.99	327.76	297.84	5,481.88
Ozark	1,918.55	1,865.45	1,141.00	1,139.35	1,381.95	1,079.85	1,458.55	1,455.60	1,310.10	1,288.05	1,363.75	1,030.75	16,432.95
Ozark Sanatorium	322.00	336.05	310.90	243.80	295.05	185.15	309.60	344.10	342.05	467.35	335.35	259.05	3,750.45
Pythian						10.35	202.30	240.80	288.90	254.70	274.25	221.00	1,492.30
Rector	209.30	221.65	266.90	147.10	175.40	133.80	178.30	219.05	270.70	234.05	120.00	82.40	2,258.65
Rockafellow	1,411.80	1,409.80	922.12	852.62	776.65	645.62	1,234.15	1,386.95	1,531.47	900.10	1,089.15	892.65	13,053.08
St. Joseph's Infirmary	251.25	289.30	149.50	213.00	178.75	234.20	303.65	458.75	426.25	326.00	138.00	278.00	3,251.65
Total	16,460.71	17,147.64	12,065.82	10,621.58	12,085.22	11,011.94	20,622.21	26,098.54	28,669.38	18,653.27	14,975.96	12,216.74	200,629.21

Fees received by bath attendants in the bathhouses during the fiscal year ended June 30, 1915.

Bathhouse.	Gross amount.	Redemptions.	Net amount.
Alhambra	$5,109.60	$594.60	$4,515.00
Arlington	5,662.05	747.85	4,914.20
Buckstaff	7,223.85	776.85	6,447.00
Eastman	1,197.75	100.50	1,097.25
Fordyce	2,777.25	339.60	2,437.65
Great Northern	1,008.45	145.95	862.50
Hale	4,537.20	716.70	3,820.50
Horseshoe	4,148.55	712.50	3,436.05
Hot Springs	332.85	46.35	286.50
Imperial	4,445.55	387.85	4,057.70
Lamar	5,265.15	544.95	4,720.20
Magnesia	2,570.25	359.55	2,210.70
Majestic	5,067.45	852.00	4,215.45
Maurice	7,928.25	831.15	7,097.10
Moody	2,319.30	275.40	2,043.90
Ozark	9,434.10	1,330.95	8,103.15
Ozark Sanatorium	1,763.25	170.55	1,592.70
Pythian	606.05	39.30	566.75
Rector	982.80	140.10	842.70
Rockafellow	5,847.90	510.80	5,337.10
St. Joseph's Infirmary	1,358.10	141.90	1,216.20
Total	79,585.70	9,765.40	69,820.30

RADIOACTIVITY OF THE WATERS.

In 1904 the Secretary of the Interior authorized Dr. Bertram B. Boltwood, of Yale University, to report on the radioactivity of the waters. The following résumé of Dr. Boltwood's conclusions appeared in the Annual Report of the Secretary of the Interior for 1904:

* * * The results of the electroscopic tests of the gases obtained by boiling the waters were very satisfactory, as they showed that the waters at Hot Springs are radioactive to a marked degree; and from other tests, taken to determine the properties of the emanation from the waters, it was found that the properties of these radioactive gases were identical with those of the radium emanation.

On the other hand, when water from which the gas had once been taken was boiled a second time, after being allowed to stand, no radioactivity was detected in the gas obtained from the second boiling, and it was therefore concluded that little or no radium salts existed in the waters. This conclusion was strengthened by the fact that a test of the residue of the waters which had been left by evaporation also failed to disclose any sign of radioactivity of this solid substance. A sample from the tufa deposit, formed by some of the springs on issuing from the ground, was also tested, and it was found that the amount of radium contained in 100 grams of tufa was less than one one-millionth of the quantity of radium, associated with an equal weight of uranium in pitchblende. Samples of the gas which arose from the springs were also tested, and its radioactivity was found to be less than of an equal volume of gas obtained by boiling the waters from the springs. The following conclusions are reached by Dr. Boltwood as to the result of his investigations:

1. The waters of the springs on the Hot Springs Reservation are all radioactive to a marked degree.

2. The radioactivity of the waters is due to dissolved radium emanation (a gas), and not to the presence of salts of radium or other radioactive solids.

PHYSIOLOGICAL TESTS OF THE WATER.

The pronounced benefits, in certain conditions, derived from the proper use of the Hot Springs water have been fully recognized both by the medical men and the laity. The therapeutic value of these waters in certain diseases appears to be well established by the concensus of opinion of the many bathers who have been benefited

and by physicians who have had an opportunity to observe the effects of the use of these waters.

The department has during the past caused to be made an analysis of the chemical contents of these waters, but the physiological action has never been scientifically determined with reference to the effects of the baths on either the normal or diseased subject. The baths have been given emperically for such ailments as they seem to benefit, based on the clinical experience of physicians who have prescribed the waters and observed in this way the results. No physician who is thorough and looks for the best results from the medicines he gives would think of prescribing a drug whose physiological effects and therapeutic value had not been scientifically proven and described. So a large number of physicians throughout the country hesitate to send their patients to this resort, believing, without an authentic physiological report, these waters to be of no more value than ordinary hot water.

Suitable investigation by the department, reported by the department as authentic, would change this attitude. I believe that an exhaustive experimentation should be made along the following lines:

1. To test elimination, it should be made before the subject takes the baths, using perfectly healthy subjects to get the true physiological effect, the total solids eliminated by the kidneys within twenty-four hours, this to be done on several subjects and successive days. Then these subjects should be given the baths and the total urinary solids determined each day; also an estimate by weighing the subject before and after the sweat, of the solids eliminated through the skin (the specific gravity of the sweat to be used in making this test), and added to the total urinary solids eliminated. This has not been done and can not be done without great trouble and expense, as healthy subjects would have to be employed.

2. To test the constructive effect of the increased cell activity of the blood-making system, anemic subjects should be selected and a hæmoglobin percentage and a white and red cell count made before beginning the baths and again after every few baths, say, every third, fifth, or seventh day. In the meantime a regular diet should be observed and no medicines be given which would affect the hæmoglobin or the blood-cell count.

This briefly outlines the first steps that would be taken in case a physiological test should be made, and it is estimated that approximately two years would be required to complete the work.

In view of the many thousands of people who visit Hot Springs annually for the benefit of the baths, and for the information it would give the physician who could prescribe more rationally and not empirically, I am decidedly of the opinion that an investigation should be undertaken and conducted completely with the object of ascertaining what definite and demonstrable physiological effects the water is capable of producing.

RECOMMENDATIONS.

As the result of my observations and information gathered during my administration of the affairs of the Hot Springs Reservation for nearly a year past, I am firmly convinced that this is the most valuable holding in the possession of the General Government on account of its

life-giving and healing thermal springs and that in the near future Congress should provide liberally for the extensive improvement and beautification on an elaborate scale of the Hot Springs Mountain. In order that this matter may be laid before Congress intelligently I recommend that the general superintendent and landscape engineer of National parks, Mr. Mark Daniels, be authorized to cause to be prepared a complete and comprehensive plan and estimate of cost for the permanent improvement of the Hot Springs Mountain on a scale that would, when completed, surpass any of the European resorts. The work necessary to carry out a plan of this magnitude would of necessity extend over a period of several years and Congress could each year make an appropriation sufficient to complete that portion of the plan which might be deemed most advisable. Experience has demonstrated that work done systematically is much more satisfactory than if done haphazard. I have in mind several prospective improvements which I would be glad to discuss with the general superintendent, looking to their incorporation if feasible in a general plan as outlined above.

I have been surprised to find from personal conversation with visitors from all sections of the United States what a small proportion of the inhabitants as a whole have any knowledge of the Hot Springs Reservation, Ark., or the properties of its waters. To remedy this condition and give to the vast number of persons throughout the country who are afflicted with diseases in which these waters are indicated and the efficacy of which is demonstrated by the Government at the Army and Navy Hospital here each year, I would suggest that some more effective method of publicity be adopted by which such persons could be reached with true information relative to the merits of Hot Springs as a health resort. Every effort should be made to convey to suffering humanity reliable information as to just what health features this Government has to offer for their benefit and relief.

As the department is so thoroughly familiar with the urgent necessity for the rebuilding or reconstruction of the present free bathhouse, I respectfully recommend that steps be taken at the earliest possible date looking to the rebuilding or reconstruction of this house along modern and sanitary lines in order that suitable baths may be provided for persons who come to Hot Springs and are unable to obtain means with which to pay for baths. It is believed that the new bathhouse should be constructed on the present site and it is possible that the present foundation and walls might be used in its reconstruction. However, this is a matter to be determined later. I have recommended that the amount of $75,000 be appropriated for this purpose, this estimate being based upon the cost of bathhouses which have been constructed on the reservation during the past four or five years.

I wish to renew the recommendation heretofore made for an appropriation of $237,840, which has been based on a scientific estimate, by the Government for the construction of a storm sewer and surface drainage system in the city of Hot Springs to care for the drainage from the reservation.

I also wish to renew the recommendation of an appropriation of $96,595, also based upon a scientific estimate, for the construction of a sewer system in Hot Springs to provide for the sewerage from the reservation.

A modern comfort station should be erected convenient to Bathhouse Row, preferably near the free bathhouse also, as in that way the necessary janitor work could be performed by the employees of the bathhouse.

It is recommended that Fountain Street, bounding the Hot Springs Mountain Reservation on the north, be paved with some suitable material from Central Avenue to a point even with Government Monument No. 36, at which point Fountain Street connects with the system of roads on Hot Springs Mountain; also Reserve Avenue, bounding the reservation on the south, should be similarly paved from Central Avenue to point even with monument No. 26, which would carry the pavement just beyond the grounds occupied by the superintendent's official residence. It is believed that the property owners on the opposite side of these streets from the reservation would be willing to pay their proportionate share for such a valuable and needed improvement.

It is recommended that Congress cede Whittington Lake Park to the city of Hot Springs for use as a municipal park, and in the event the city declines to accept the trust the Secretary of the Interior should be authorized to divide the park into lots and blocks in his discretion and offer the same for sale at public auction. This park is far removed from the reservation proper, and while it would be a valuable adjunct to the city it is believed that its retention by the Government is impracticable, as expenditures by the Government for improvements in the future should be confined to the Hot Springs Mountain Reservation and its immediate vicinity.

I also recommend the completion of the system of rubblestone retaining walls and gutters on North and West Mountain Roads, and also that these roads be graveled in many places, which is now necessary on account of the heavy rains having disturbed the surfaces.

The terms of a recent act of Congress make it necessary to obtain specific appropriations for the maintenance of passenger-carrying vehicles in the Government service, and I have therefore to recommend an appropriation of $500 from the revenues of the reservation for the care and maintenance of passenger-carrying vehicles on the Hot Springs Reservation for the fiscal year ending June 30, 1917. This estimate contemplates the feeding, shoeing, and other care of the one horse, and the repair and maintenance of the two passenger-carrying vehicles now in use on the reservation and also the purchase of one new four-passenger vehicle which will be required before the expiration of the fiscal year 1917.

CITY OF HOT SPRINGS.

The city of Hot Springs is a municipality governed under State and municipal laws. The Department of the Interior exercises no control or supervision over any matters connected with the city.

It is situated in the midst of beautiful surroundings and enjoys all the modern facilities of cities ten times its size, although its resident population is only 16,000. Its new public utility service is unsurpassed and managed in a most satisfactory manner. It has splendid churches of every denomination, and the new Methodist, recently constructed at a cost approximating $100,000, is probably

unsurpassed for its size throughout the South. The hotels are modern in every respect and the boarding houses are cozy and inviting and the prices are moderate. Furnished apartments and cottages can be obtained at a moderate cost. The climate is good the year round, and the elevation of the city proper is 600 feet above sea level and the surrounding mountains 500 to 600 feet higher than the city.

The large area burned on September 5, 1913, has been nearly all rebuilt, mostly with modern and ornamental brick structures, which tends to show a prosperous and healthy condition.

CONCLUSION.

In conclusion, I wish to state that from the standpoint of a disinterested physician I have the utmost confidence in the hot waters as a curative agency, and I predict for Hot Springs a most brilliant future as a health-pleasure resort and that each succeeding year will bring a greater number of visitors. The municipality of Hot Springs as well as its citizens should at all times work hand in hand with the General Government, and by this means of concerted action its world-wide reputation will be assured. Many disagreeable features have been eliminated by the city during the past few years and conditions generally improved.

Closing this, my first annual report, I have the honor to be,

Very respectfully,

WILLIAM P. PARKS,
Superintendent.

The SECRETARY OF THE INTERIOR.

APPENDIX.

RULES AND REGULATIONS, WITH ALL AMENDMENTS THERETO, UP TO AND INCLUDING JUNE 30, 1915, FOR THE GOVERNMENT OF ALL BATHHOUSES RECEIVING HOT WATER FROM THE UNITED STATES RESERVATION AT HOT SPRINGS, ARK.

RULE 1. Bathhouses or hotels will be allowed such number of tubs as the Secretary of the Interior may, in his discretion, deem proper and necessary for the public service and the amount of hot water will justify.

RULE 2. The constant flow of hot water for vapor or other baths, even during business hours, or the unnecessary waste of water in any manner, is strictly prohibited, and will, if continued after written notice from the superintendent to stop such waste of water, be considered by the department sufficient grounds for the cancellation of the lease of such offending lessee.

RULE 3. Rentals must be paid quarterly, in advance, at the office of the superintendent, and if not paid within five days from the beginning of each quarter the supply of water may be cut off.

RULE 4. The charge for baths at the different bathhouses shall be at the rates fixed by the Secretary of the Interior, and no bath tickets shall be sold for more than said rate, and then only to such persons as intend to actually use them for bathing. The rate or rates so fixed for baths shall include, without extra charge, the supplying of each bather with one clean sterilized sheet to envelop the body of the bather while in the bath hall and cooling room. In event of charges in a less amount being exacted for baths, such new rate shall at once be reported to the superintendent, and when approved by the department shall thereafter become the maximum rate. No bath ticket shall be sold except at the office of the bathhouse where the bath is to be given, and tickets must show the date when issued, the serial number, the number of baths for which issued, the full name of the purchaser, and the amount paid therefor. Bath tickets shall be redeemable for the same proportionate price for which they were sold, when presented by the original purchaser: *Provided*, That when less than seven baths have been taken on any ticket presented for redemption the bathhouse may charge the rate for single baths for the number of baths taken on said ticket. No bath ticket or part of a ticket shall be reissued after having been redeemed. No bathhouse receiving water from the Hot Springs Reservation will be permitted to issue complimentary bath tickets, except that bathhouse lessees may, on written permission of the superintendent, issue complimentary bath tickets in such cases as in his judgment justify such action. The renting and selling of bath robes, towels, soap, toilet articles, or articles of merchandise in bathhouses is prohibited.

RULE 5. The owners or managers of bathhouses receiving waters from the Hot Springs Reservation are prohibited from bathing in

said bathhouses persons stopping at any hotel, boarding house, or rooming house which has a drummer or solicitor on trains or the owner of which drums or solicits on trains, or drums or solicits business for doctors, or who has employed in or about such house any inside man or person engaged in drumming or soliciting business for doctors or bathhouses; also the owners or managers and the employees of such bathhouses are absolutely prohibited from either directly or indirectly drumming for doctors or reflecting on or questioning the integrity of the hot-water supply of any other bathhouse, or of claiming superiority of its own supply of hot water over that furnished from the springs on the reservation to other bathhouses. Upon evidence of violation of this rule, the superintendent shall report the facts, with his recommendation, to the Secretary of the Interior, looking to the shutting off of the water from any bathhouse or canceling the lease, as the department may determine.

RULE 6. Owners and managers of bathhouses receiving waters from the Hot Springs Reservation will provide in their respective bathhouses the requisite number of head bath attendants, who, under the supervision and direction of the superintendent of the Hot Springs Reservation, shall supervise the administration of baths, the treatment of patients, matters of hygiene and sanitation in the bathhouses, and the work of bath attendants generally. Bathhouse attendants shall be allowed to charge for their services not exceeding 15 cents for a single bath, $1 per week, or $3 per course of 21 baths, to be collected for the attendant by the bathhouse manager and properly accounted for by him to the attendant. The duties of the attendant shall consist in the administration of the baths in strict accordance with the bathing directions of registered physicians and in lieu of these as ordered by the superintendent. They shall be required to clean and care for such parts of the bathhouse as may be assigned them by the manager, subject to the approval of the superintendent, to keep themselves in a neat and cleanly condition both in person and in dress, and to make good any damages accruing from breakage or neglect of duty. They shall not be required to handle helpless individuals, rub mercury, furnish mops, brooms, or cleaning materials, furnish or launder towels, mitts, sheets, or robes; pay for the services of the porter or perform work which properly belongs to him, or incur any expense whatsoever incident to the operation of the house not specifically authorized. It shall be optional with the bather whether he employ an attendant or not. No person shall be employed or permitted to serve or occupy space in any bathhouse as a mercury rubber or as a masseur without the approval of the superintendent first had and obtained; and every person so employed or serving shall be subject and amenable to the rules and regulations the same as attendants and other bathhouse employees.

RULE 7. The payment of any sum of money or anything of value, either directly or indirectly, by any bathhouse owner, manager, clerk, or attendant as compensation for drumming customers to any bathhouse, or allowing public drummers, drumming doctors, hotel or boarding-house proprietors who are drummers, or persons who work with them as inside men, to bring persons or show them through, or to loiter in or about any bathhouse is positively forbidden. Upon evidence of violation of this rule, the superintendent shall report the facts, with his recommendation, to the Secretary of the Interior,

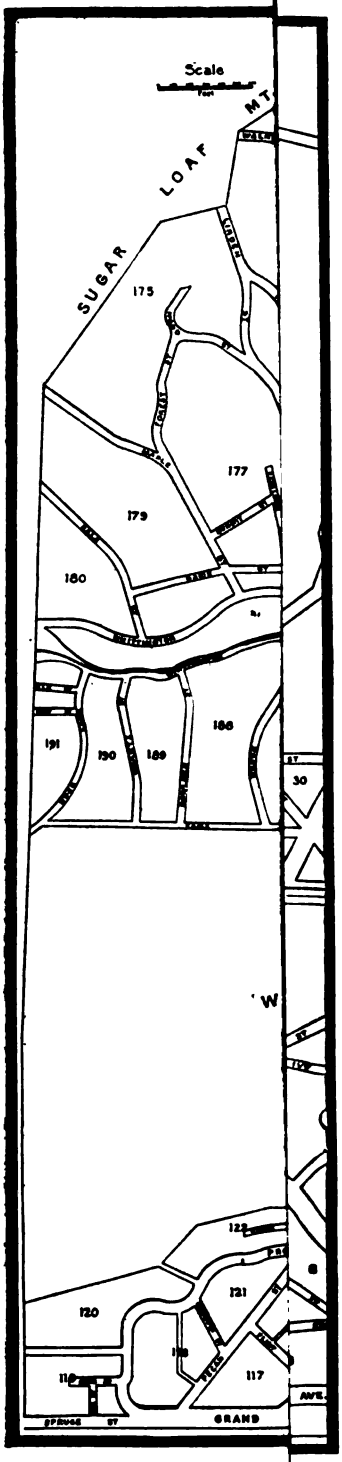
looking to the shutting off of the water from any bathhouse or canceling the lease, as the department may determine.

RULE 8. The lessee of each bathhouse shall cause to be kept a full and correct daily register of each bath given, the number and kind of bath tickets sold, and the number of complimentary tickets, if any, issued each day, etc., such form of register to be approved by the superintendent and a copy therefrom of each day's business to be forwarded to the superintendent daily. No person shall be allowed to bathe without a numbered ticket being issued and a record of the same being kept, and report thereof, duly certified by the manager, filed with the superintendent on the first day of each month as paid, complimentary, or free baths, together with any information he may have showing a violation of the bathhouse rules and regulations which may be susceptible of proof.

RULE 9. All bathhouses receiving deposits of jewelry, money, or other valuables from bathers must provide means satisfactory to the superintendent of the reservation for the safe-keeping thereof. It is to be understood, however, that the Government assumes no responsibility in the premises. All losses must be promptly reported to the superintendent by the bathhouse manager.

RULE 10. An applicant for baths who is under medical treatment shall not be permitted to bathe in any bathhouse supplied with hot water from the Hot Springs Reservation unless said applicant presents satisfactory evidence that he or she is the patient of a physician who is duly registered at the office of the superintendent as qualified to prescribe the waters of the hot springs, and who is known not to engage in drumming for custom: *Provided*, That every applicant for baths, not under the care of a registered physician, shall be required to make a certificate to be filed with the bathhouse manager that he or she is not under the care of any physician, and should such applicant subsequently employ, consult, or take treatment from any physician while taking baths, then in such case he or she will immediately notify the bathhouse manager of such fact. The violation of this rule by the owner, manager, or any employee of a bathhouse receiving hot water from the reservation will result in the cutting off of the water from the bathhouse or the canceling of the lease, as the department may determine.

RULE 11. Physicians desiring to prescribe the waters of the hot springs, either internally or through the medium of baths, must first be registered at the office of the superintendent of the reservation, and shall use only such uniform form of bathing directions as meets with the approval of the superintendent. Registration will be accorded only to such physicians as are found by a board designated by the Secretary of the Interior to have proper professional qualifications and character and who do not engage in drumming for custom. No physician who shall engage in the solicitation of patronage through the medium of drummers or otherwise, or who shall engage in unprofessional, disreputable, or dishonest conduct, or is addicted to the drug or other habit which disqualifies him for the performance of his professional duties, shall be or remain registered. In case any person who, in violation of these regulations, bathes or attempts to bathe, or enters or attempts to enter upon the Hot Springs Reservation to bathe, shall have the permit of a physician therefor, such physician shall be liable to the penalties



LEGEND.

The numbers in this list refer to the smaller numbers on the map; the larger numbers on the map are the numbers of the squares.]

1. Superintendent's office.
2. Lamar bathhouse.
3. Buckstaff baths.
4. Ozark bathhouse.
5. Magnesia bathhouse.
6. Horse Shoe bathhouse.
7. Palace bathhouse.
8. Maurice bathhouse.
9. Hale bathhouse.
10. Superior bathhouse.
11. Arlington Hotel and baths.
12. Government free bathhouse.
13. Imperial bathhouse.
14. Hot Springs bathhouse and hotel.
15. Rector bathhouse and Waukesha Hotel.
16. Rockafellow bathhouse and hotel.
17. Majestic Hotel and baths.
18. St. Joseph Infirmary.
19. Great Northern Hotel and baths.
20. Post office.
21. Business Men's League.
22. Rock Island Station.
23. Iron Mountain Station.
24. Ozark Sanitarium.
25. Alhambra bathhouse.
26. Moody Hotel and baths.
27. City Hall and Auditorium Theater.
28. ═══ Electric street car lines.
29. Main entrance to reservation.
30. Park Hotel and baths.
31. Eastman Hotel and baths.
32. Arkansas National Bank.
33. Security Bank.
34. Citizens National Bank.
35. Elks' Home and Masonic Temple.
36. First Baptist Church.
37. First Methodist Church.
38. Episcopal Church.
39. Catholic Church.
40. First Presbyterian Church.
41. Whittington Lake Park.
42. High-school building.
43. County courthouse.
44. Superintendent's official residence.

North, West, and Hot Springs Mountains and Whittington Lake Park form the permanent Hot Springs Reservation, owned and operated by the Government.

provided in the act of April 20, 1904, unless he is regularly registered, but the bather or person attempting to bathe shall not be liable to the penalties of said act unless it shall be made to appear that he knew or had reason to believe that the physician giving him the permit to bathe was not regularly registered.

RULE 12. If a charge is made to the superintendent in writing, under oath, supported by the affidavits of two or more witnesses, that a registered physician has violated any of the laws or regulations pertaining to the government of the bathhouses receiving hot water from said reservation, the registered physician against whom the charge is made shall be immediately notified by the superintendent of the fact that affidavits have been made and be accorded an opportunity to cross-examine the witnesses on the subject thereof, in the presence of the superintendent, and the affidavits so filed, with the answers to such interrogatories as may be propounded by the physician, when completed, shall be duly certified by the superintendent and turned over to the Federal registration board, and thereafter, if in the judgment of the board the facts warrant such action, they will immediately cite the physician to appear before such board on a day to be named, within not exceeding 10 days from date of notice, to show cause why his name should not be stricken from the register of physicians authorized to prescribe the hot waters of said springs, and pending the investigation and final action upon such charges the right of such physician to prescribe the hot waters may be suspended by the Federal registration board The physician against whom such complaint is made shall have the right to file further written interrogatories pertinent to the issue to such complaints or witnesses, to be answered by them under oath, and may submit within 20 days thereafter counter affidavits in answer to the charges made in the affidavits of said witnesses.

The complainant witnesses may file rebuttal affidavits within 10 days after the service upon them of said counter affidavits, and the hearing of said charges shall be had on the record aforesaid. An appeal from the decision of said board and upon said record may be taken within seven days from such decision to the Secretary of the Interior.

If upon consideration of the complaint the charge is not sustained, the suspension will be immediately removed. If, however, such charge is sustained, or if default be made, the name of the physician shall be stricken from the registered list.

RULE 13. Persons violating any of the foregoing regulations within the purview of the act of April 20, 1904, entitled "An act conferring jurisdiction upon United States commissioners over offenses committed in a portion of the permanent Hot Springs Mountain Reservation, Ark.," and the act of March 2, 1907, amendatory thereof, will be deemed guilty of a misdemeanor and be subjected on conviction to the payment of a fine, as provided in said act of April 20, 1904, of not exceeding $100, and be adjudged to pay all costs of the proceeding.

RULE 14. All bathhouses shall be kept in a neat, clean, and sanitary condition, and all sewage and waste water properly conducted away, and all underdrainage kept in perfect order. The water-closets shall have sufficient and free connection with the public sewers and be kept in the best order and with the best plumbing furnishings

and appliances. Lessees of bathhouses on the permanent reservation shall, under the direction of the superintendent, cultivate and maintain the parts of the bathhouse park in front of their respective bathhouses, the space for each to cultivate to be allotted by the superintendent.

RULE 15. Each bathhouse manager, clerk, and attendant shall be required to have a full and complete understanding of the bathhouse rules and regulations before entering upon his duties.

The superintendent is authorized to require the discharge of any bathhouse manager, clerk, attendant, mercury rubber, or masseur for bathhouse or doctor drumming, or refusing or neglecting to carry out the bathhouse rules and regulations according to the true intent and meaning thereof.

Any person discharged for cause from a bathhouse or removed at the request of the superintendent shall not be again employed by the same or any other bathhouse or permitted to render service in any bathhouse without the written consent of the superintendent. Managers must promptly report in writing to the superintendent the name of any person so removed.

RULE 16. Automobiles will not be permitted on the roads in the Hot Springs Reservation without the consent of the Secretary of the Interior first had and obtained.

A neatly framed copy of the rules and regulations now in force, together with the prices of baths and attendant's fees, both separately and combined, printed in large black type on white cardboard, shall be conspicuously posted in the office of each bathhouse.

PHYSICIAN'S APPLICATION FOR REGISTRATION.

To the board of physicians appointed by the Secretary of the Interior to pass upon the qualifications and character of physicians to prescribe the waters from the Hot Springs Reservation:

1. I was born at.....
2. My preliminary education was obtained.....
   (State common school or collegiate.)
   .....
   (If the latter, name of college and date of degree.)
3. I graduated in medicine from.....on the.....day
   (Give name of college.)
   of....., 1.....
4. My State certificate was issued.....
   (When and where.)
5. From what county issued.....
   (When.)
6. Society membership:
   County.....
   State.....
   American Medical Association?.....Special.....
   (Yes or no.)
7. I have practiced at my present location.....years, and have practiced at the following places for the years named.....
8. I now hold or have held the following positions.....
   (Give places of trust or honor
   .....
   held now or in the past; prices received and dispensary or college appointments.)
9. I have during the 10 years next preceding the date of this application resided at the following-named places, and was engaged in the following business:
   .....
   (State period of residence at each place and business engaged in while there.)
10. I am.....
    (State "general practitioner" or specialty, if any.)

11. Do you employ drummers to solicit business?.....
(Yes or no.)

12. Do you pay commissions on any of your professional business, either directly or indirectly?.....
(Yes or no.)

13. Have you paid commissions on any of your professional business or given anything of value, either directly or indirectly, for such purposes during the past two years?.....
(Yes or no.)

14. If so, when did you quit, and why?.....
(Date.)

15. If registered, will you faithfully observe the rules and regulations approved by the Secretary of the Interior regarding the use of the waters of the Hot Springs?.....
(Yes or no.)

16. My office is.....Street; residence.....Street; telephone number.....

.....

Subscribed in my presence and sworn to before me this.....
day of....., 191.....

.....,
Notary Public.

My commission expires.....
Reported and examined.....

REGULATIONS OF JULY 7, 1900, FOR THE GOVERNMENT OF THE FREE BATHHOUSE.

These baths are provided and maintained by the United States pursuant to the requirements of the act of Congress approved December 16, 1878 (20 Stat., 258), for the use of the indigent only; neither the manager nor attendants are authorized to supply them to others.

The manager of the free bathhouse is required to enforce a strict observance of the following rules and regulations:

RULE 1. No baths will be supplied except on written application made on blanks furnished at the office of the bathhouse, making full answers to the questions therein propounded; then if the applicant is found to be indigent (in accordance with the common acceptance of the word), the manager will issue a ticket good for 21 baths, which may be reissued on the same application if necessary.

RULE 2. Persons using the free baths are required to maintain quiet and orderly deportment while in or about the bathhouse, to abstain from the use of tobacco, either by chewing or smoking, while in the pool rooms, dressing rooms, or office, not to scatter rags or paper on the floor, or to loiter in or about the building after bathing.

RULE 3. The wanton exposure of person or entering any of the front rooms in a nude state, the use of loud, vulgar, or profane language, and the use of rags, paper, soap, or any foreign substance in the pool rooms are positively prohibited.

RULE 4. Persons using these baths are not allowed to stand or sit on or in any way interfere with the water pipes or valves or to stand on the chairs or benches. All persons entering the house are required to clean their feet at the door and avoid as much as possible bringing dirt or mud on the floors. Boys over 5 years of age will not be allowed in the female department during bathing hours.

RULE 5. Any willful or repeated violation of these rules, or any disorderly or contemptuous conduct, will subject the persons so

offending to suspension or expulsion, at the discretion of the superintendent of the reservation.

RULE 6. Neither the manager nor the Government attendants shall be allowed to receive or become responsible for any valuables or to charge any fee for any service rendered to bathers which comes within the direct line of their duty.

RULE 7. The manager is required to enforce all the foregoing rules and to maintain good order in and about the bathhouse, to see that all indigent persons applying are supplied with baths, and to make a written report to the superintendent each month on blank forms supplied for that purpose. He may reject any application for free baths if he has reason to believe the applicant has made false answers in his written application, and the aggrieved may appeal to the superintendent of the reservation.

APPLICATION FOR BATHS AT THE GOVERNMENT FREE BATHHOUSE AT HOT SPRINGS, ARK.

DEPARTMENT OF THE INTERIOR.

HOT SPRINGS RESERVATION.

The acts of Congress approved December 16, 1878 (20 Stat., 258), and March 2, 1911, restrict the use of free baths to the indigent; in other words, to persons who are poor, needy, in want, or without means of comfortable subsistence.

Act of March 2, 1911:

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That only persons who are without and unable to obtain the means to pay for baths and are suffering from ailments for which bathing in the water of the Hot Springs Reservation will afford relief or effect a cure shall be permitted to bathe at the free bathhouse on the public reservation at Hot Springs, Arkansas, and before any person shall be permitted to bathe at the free bathhouse on the reservation he shall be required to make oath, before such officer duly authorized to administer oaths for general purposes as the Superintendent of the Hot Springs Reservation shall designate, that he is without and unable to obtain the means to pay for baths, and any person desiring to bathe at the free bathhouse on the Hot Springs Reservation making a false oath as to his financial condition shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be subject to a fine of not to exceed $25, or thirty days' imprisonment, or both."

Persons desiring to use the free baths are required to answer the following questions, in writing, and sign and swear to the same, giving full name and home address:

Name, ...
Home town, ... State, ...
Present address in Hot Springs: Street and No. .....
Native of what country?..... Age, ...years.
Have you a family?..... How many in family?.....
Occupation, ... Are you able to work?.....
Are you employed now?..... By whom?.....
In what capacity?..... Do you wish to bathe for your health?.....
With what disease are you afflicted?..... How long afflicted?.....
Are you under treatment of a physician at Hot Springs?..... If so, give his name and address, ...
Do you own any real estate?..... If so, where situate?.....
What is the value of your personal property? $..... Where located?.....
..... How much money have you? $.....
How long do you want to bathe?.....
Do you regard yourself as an indigent person?.....

(Sign here.) .....

HOT SPRINGS, ARK.

....., *191*

Subscribed and sworn to before me this the.....day of....., 191..

.....

[NOTARIAL SEAL.] *Notary Public.*

STATEMENT OF APPROPRIATIONS FOR HOT SPRINGS RESERVATION FROM MARCH 3, 1877, TO JUNE 30, 1915.

TITLE: PROTECTION AND IMPROVEMENT HOT SPRINGS RESERVATION.[1]

Revenue fund, derived from water and ground rents and sales of lots and improvements, as provided by act of March 3, 1877, treated by Treasury Department, for bookkeeping purposes, as Indefinite appropriation:

1877[2]		1899	$18,580.00
1878	$5,035.00	1900	18,670.00
1879	2,881.88	1901	18,220.00
1880	2,774.03	1902	18,235.00
1881	5,820.47	1903	18,120.00
1882	37,323.70	1904	18,430.00
1883	13,442.94	1905	19,330.00
1884	30,944.07	1906	19,748.33
1885	4,996.85	1907	20,165.00
1886	4,705.00	1908	28,090.00
1887	4,705.00	1909	34,475.00
1888	7,241.40	1910	36,540.00
1889	12,490.00	1911	$36,060.00
1890	13,090.00	1911	[3] 82,518.00
1891	19,682.00		118,578.00
1892	59,282.50	1912	35,279.16
1893	15,798.12	1913	40,711.00
1894	16,780.00	1914	38,380.00
1895	18,305.00	1915	37,877.66
1896	16,125.88		
1897	18,000.00	Total	867,324.24
1898	18,471.25		

SPECIFIC APPROPRIATIONS BY CONGRESS FROM REVENUE FUND.

Improvement of Whittington Lake Reserve from proceeds from sale of lands, included in above fund, 1892[3] (sundry civil act of Aug. 5, 1892)	[4] $30,000.00
To repay expenditures upon a sewer, 1896 (act of May 1, 1896)	[4] 930.00
Survey of the sewer system of the city of Hot Springs, preparation of plans and estimate of cost of increasing present storm-drainage system as well as present sanitary sewer system of the city of Hot Springs, one-half ($5,000) to be paid from the revenues of the reservation and one-half ($5,000) to be paid by the city of Hot Springs (sundry civil act of Aug. 24, 1912), $10,000	[4] 5,000.00
Total	35,930.00

TITLE: IMPROVEMENT HOT SPRINGS RESERVATION.[1]

SPECIFIC APPROPRIATIONS BY CONGRESS FROM REVENUE FUND.

Improvement of Hot Springs Creek, 1883.[3] (Sundry civil act of Aug. 7, 1882)	[4] $33,744.78

This amount accrued to the revenue fund from operation of the bathhouses by the Court of Claims receiver in 1878.

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[1] Designations given on books of Treasury Department.
[2] Years scheduled on books of Treasury Department.
[3] Received from the sale of Government lots in the city of Hot Springs.
[4] Without year.

TITLE: SALARIES AND EXPENSES HOT SPRINGS COMMISSION.[1]

Salaries and expenses Hot Springs Commission, 1877[2] (sundry civil act of Mar. 3, 1877)	[3] $27,500.00
Same as above, 1878 (deficiency act of Dec. 15, 1877)	[3] 15,000.00
Same as above, 1879 (act of Dec. 16, 1878)	[3] 27,500.00
Same as above, 1879 (deficiency act of Mar. 3, 1879)	[3] 12,000.00
Total	[4] 82,000.00

TITLE: PROTECTION AND IMPROVEMENT HOT SPRINGS RESERVATION.[1]

SPECIFIC APPROPRIATIONS BY CONGRESS FROM MONEYS IN TREASURY NOT OTHERWISE APPROPRIATED.

Improvement of Hot Springs Creek, 1885[2] (sundry civil act of July 7, 1884)	[5] $75,000.00
Same as above, 1886 (sundry civil act of Mar. 3, 1885)	[5] 8,000.00
Same as above, 1887 (sundry civil act of Aug. 4, 1886)	[5] 20,000.00
Reservoirs, pumps, piping, and improvement of the free bathhouse, 1889 (sundry civil act of Oct. 2, 1888)	[5] 36,000.00
Improvement of the free bathhouse, 1890 (deficiency act of Apr. 4, 1890)	[3] 3,200.00
For mains, pipes, pumping engine, etc., 1891 (deficiency act of Sept. 30, 1890)	[3] 5,000.00
Construction of roads, 1892 (sundry civil act of Mar. 3, 1891)	[5] 5,000.00
Total	152,200.00

TITLE: HOT SPRINGS RESERVATION.[1]

SPECIFIC APPROPRIATIONS BY CONGRESS FROM MONEYS IN TREASURY NOT OTHERWISE APPROPRIATED.

Repairs to roads, drives, etc., and remodeling the free bathhouse, 1903[2] (sundry civil act of June 28, 1902)	[3] $47,562.00
Repairs to roads, etc., and storage reservoir, 1904 (sundry civil act of Mar. 3, 1903)	[3] 30,500.00
Reimbursement of disbursing officer, 1904 (deficiency act of Feb. 18, 1904)	[5] 500.00
Installation of electric motor for the free bathhouse, 1904 (deficiency act of Apr. 27, 1904)	[5] 1,550.00
For gutters on mountain roads, 1905 (sundry civil act of Apr. 28, 1904)	[5] 8,000.00
Filling lakes in Whittington Park, 1906 (sundry civil act of Mar. 3, 1905)	[5] 6,000.00
Total	94,112.00

TITLE: CLAIMS FOR CONDEMNATION OF BUILDINGS, HOT SPRINGS RESERVATION.[1]

SPECIFIC APPROPRIATIONS (INDEFINITE) FROM MONEYS IN TREASURY NOT OTHERWISE APPROPRIATED (SUNDRY CIVIL ACT OF MAR. 3, 1911).

1902[2]	[3] $26,385.45
1903	[3] 18,372.07
1904	[3] 3,500.00
1911	[3] 2,935.00
Total	51,192.52

Up to June 30, 1915, in addition to the above appropriations, there has been expended the sum of $464,811.39, under the direction of the War Department, upon the Army and Navy Hospital, located on Hot Springs Reservation.

[1] Designations given on books of Treasury Department.
[2] Years scheduled on books of Treasury Department.
[3] Without year.
[4] Reimbursable from fund arising from sale of Hot Springs lots, but treated by Treasury Department as a direct appropriation.
[5] Limited to fiscal years.

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